

A Survey Assessment of Pediatric Nurses' Disaster Preparedness

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Dedication

I would like to dedicate this dissertation to my family, friends, and co-workers who have supported me throughout my life, including during graduate school. Their support has been immeasurable. My family has always been my source of strength, and I hope I continue to make them proud. I would like to thank my committee and program chair (Drs. Lisa Lindley, Lisa Davenport, Katherine Newnam, John Orme, and Sandra Thomas) for their guidance and commitment to my education.

Abstract

The training programs for disasters in the US are fragmented, uncoordinated, and poorly defined. The purpose of this study was to assess the perceived disaster preparedness of inpatient nurses at a Midwestern level 1 pediatric trauma center. The Disaster Preparedness Evaluation Tool was used to assess disaster preparedness, response abilities, recovery preparedness, and overall preparedness. The Theory of Self-Efficacy was applied to disaster preparedness in this study. Performance accomplishments were conceptualized as prior disaster experience and level of education, vicarious experience as training and drills, verbal persuasion as nurse manager or staff nurse role, and emotional arousal as department/unit type (Emergency Department (ED) or non-Emergency Department). The three main areas addressed in the study included the level of preparedness among inpatient pediatric nurses, the influence of unit type on preparedness, and factors that impact preparedness. Levels of preparedness were compared by unit type (ED and non-ED), previous disaster experience, and disaster education. There were statistically significant differences between ED and non-ED nurses for all four dependent variables (disaster preparedness, response abilities, recovery preparedness, and overall preparedness), and unit type was a statistically significant positive predictor of disaster preparedness, response abilities, and overall preparedness. Disaster education was a positive predictor of response abilities, recovery preparedness, and overall preparedness and participation in a disaster was a positive predictor of response abilities and overall preparedness. Overall, study findings indicated that nurses were under-prepared for a disaster. Theoretical implications of the study include the conduction of theory-based disaster nursing research, as well as national policies on training and education.

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Chapter 1: Background and Significance

Problem Statement

In 2017, there were 137 federally declared disasters in the United States (US) (Federal Emergency Management Agency, 2018a). The International Federation of Red Cross and Red Crescent Societies (2018a) defines a disaster as a “sudden calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community’s or society’s ability to cope using its own resources” (p. 1). These events range from natural (e.g., earthquakes) to man-made disasters (e.g., wildfires).

Disaster response is a community-wide effort. Hospitals work alongside other community resources including local emergency medical services, engineers, and transportation services, and play a critical role in providing medical care for disaster victims (Institute of Medicine of the National Academies, 2007). An estimated 5,000 Emergency Departments (EDs) across the United States treat children (Emergency Medical Services for Children, 2018b). Children are considered patients under 18 years of age (NCCD, 2010). There are approximately 250 children’s hospitals across the country, providing dedicated pediatric services (Children’s Hospital Association, 2018). In 2015, a children’s hospital had an average of 41,913 ED visits and 7,993 inpatient admissions (Children’s Hospital Association, 2018).

Preparedness is crucial in executing an effective disaster response (IFRC, 2018b). Preparedness is defined as “measures that ensure the organized mobilization of personnel, funds, equipment, and supplies within a safe environment for effective relief” (World Health Organization, 2002, p. 21). In 2013, the pediatric preparedness of 4,146 hospitals (of the 5,000 who treat children) was assessed (EMSC, 2018b). Only 47% of these hospitals had specifically included pediatrics in their disaster preparedness plans (EMSC, 2018b). Hospitals who treated

higher volumes of pediatric patients (greater than 10,000 annually) performed better, with 67% of these facilities including a pediatric focus in disaster plans (EMSC, 2018b). According to the EMSC (2018b), hospital disaster preparedness plans should include:

- Physician/staff coordinator to champion pediatric disaster coordination
- Partnership building to facilitate surge capacity
- Essential resources necessary for building pediatric surge capacity
- Triage, infection control, and decontamination
- Family tracking, security, support, and reunification
- Legal/ethical issues
- Behavioral health
- Children with special health care needs
- Staffing, exercise, drills, and training
- Recovery and resiliency

Hospitals were found to have consistent deficiencies regarding adequate inventory of pediatric equipment, supplies, and medications (EMSC, 2018a). In addition, there was insufficient training for medical staff and a lack of policies specifically addressing the needs of children in disasters (EMSC, 2018a). Therefore, there is a significant problem in pediatric disaster preparedness at both the practice and policy levels.

Background

Natural Disasters

Since 2005, there have been a reported 713 natural disasters worldwide responsible for 99,197 deaths and affecting over 270 million people (United Nations Office for Disaster Risk Reduction, 2016). The scope of, and damage from, a disaster depends on a variety of factors,

including location and population density, time of occurrence, and the level of preparedness (American Academy of Pediatrics (AAP), 2006). The United Nations Office for Disaster Risk Reduction (UNISDR, 2011) estimates that 100 million young people are affected by disasters each year and the World Health Organization estimates that children comprise 30-50% of disaster fatalities (Ronan et al., 2014). In the US, children account for approximately 25% of the population (National Commission on Children and Disasters, 2010). In response to the growing number and impact of disasters, the UNISDR developed the Sendai Framework for Disaster Risk Reduction, which was adopted by member states in 2015 (UNISDR, 2015). There are seven major focus areas in the framework, four of which emphasize health concerns. Areas of priority include reducing mortality, improving hospital safety, promoting wellbeing, and developing training for health workers, health systems, and communities (UNISDR, 2015).

Natural Disasters in the United States

Natural disasters are occurring much more frequently in the United States and around the world (Figure 1). The 2000s saw twice the natural disasters of the 1990s, which experienced a two-fold increase in disasters compared with the 1980s (Missouri State Emergency Management Agency, 2013). Geographical features contribute to the increased susceptibility of natural disasters in certain regions.

Missouri, the site of the research study, is one state that has experienced significant disasters. Missouri is at risk for natural disasters due to the ever-changing weather, variations in temperature, and its position on two major rivers (the Mississippi and Missouri) and a fault line (SEMA, 2018). Since 1957, Missouri has declared 59 disasters due to weather events alone, including tornadoes, floods, and ice storms (SEMA, 2018). On May 11, 2011, Joplin, Missouri

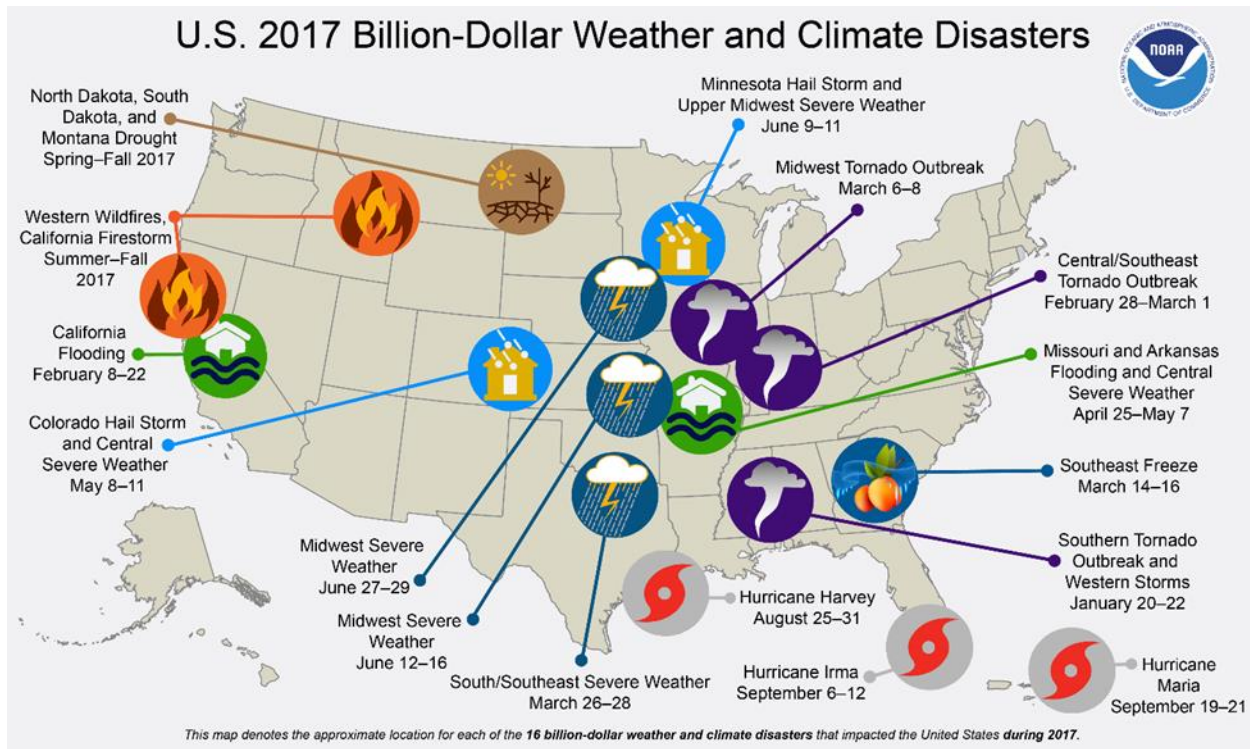


Figure 1
Natural Disasters in the United States (NOAA, 2015)

experienced an EF-5 tornado, killing 161, making it the single deadliest tornado on record in the United States (National Institute of Standards and Technology, 2014). The National Guard worked alongside state and federal medical teams to establish alternate healthcare sites, as the largest hospital in the city suffered severe damage. A field hospital was functional six days after the tornado, and providers continued to care for patients in the field hospital until October 2011. Many lessons were learned from the tornado and response efforts, which have been used in preparedness and response planning (Office of Missouri Governor, 2012).

Types of Disasters

There are four categories of disasters (AAP, 2006). First, natural disasters often occur suddenly, but can frequently be predicted. Examples of natural disasters include floods, earthquakes, hurricanes, tornadoes, tsunamis, and wildfires. Second, manmade and technological

disasters are the direct result of human action, whether intentional or accidental. Third, terrorism, national, and international violence includes shootings and the release of biochemical weapons. Lastly, humanitarian disasters and complex emergencies include war, famine, and genocide (AAP, 2006). However, global pandemics such as Covid-19, which began after data collection was complete, do not have a clear category. Regardless of the type of disaster, nearly all victims will experience some form of mental and/or physical stress, and healthcare providers and other agencies need to be prepared to assist these victims (AAP, 2006).

Vulnerability of Children

Every child responds differently to disasters, but reactions are impacted by the disaster itself and how closely impacted the children and their loved ones were (Figure 2) (AAP, 2006). As a result of disasters, there are often disruptions in sanitation and infrastructure, which disproportionately affect children. This increased susceptibility is due to the unique physiologic and developmental characteristics of children (United Nations Education, Scientific, and Cultural Organization, 2016). Developmentally, children explore their environments, and may not understand the risks associated with environmental hazards with which they may come into contact (WHO, 2008). Anatomically, children are more vulnerable to dense airborne agents, as they are shorter in stature than adults and have higher respiratory rates (WHO, 2008). Additionally, children's organs are closer together, increasing the risk for multi-organ injury from projectiles sustained in a blast. They are also more susceptible to the effects of fluid loss (from dehydration or injury) due to a smaller circulating volume and less fluid reserves. Consequently, children may go into shock much quicker than adults (AAP, 2006). Growth plates are more prone to fracture, and children's cervical spines are more prone to injury. Bone calcification is incomplete, making children more susceptible to orthopedic injuries (AAP,

2006). In addition, children also have different psychological characteristics, which lead them to respond to disasters differently than adults (AAP, 2006). They are personally affected by their own disaster experience, but are also influenced by the responses of those around them, including their parents. Thus, children's response to disaster is significantly different than adults.

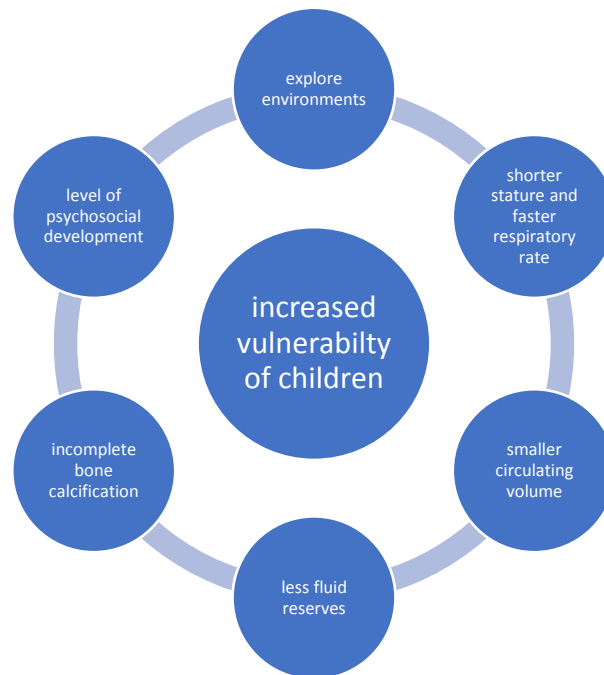


Figure 2
Factors Leading to the Increased Vulnerability of Children in Disasters

Disaster Response

Numerous federal agencies respond to disasters, including the Centers for Disease Control and Prevention (CDC), the Department of Homeland Security (DHS), and the Department of Defense (DOD). The CDC focuses on disease control and prevention, as well as environmental health concerns. The Department of Homeland Security specializes in

preparedness for, and response to, acts of terrorism. The Federal Response Plan (FRP) is essentially a contract between federal agencies regarding their roles and responsibilities when called upon to assist state and local governments during disaster response. The main emphasis of the FRP is the preservation of human lives. The Department of Defense provides the majority of medical assistance at the federal level. While each agency has specific roles, they all work together to prepare for, and respond to, disasters (AAP, 2006).

The National Disaster Medical System (NDMS) is a medical team, which responds to disasters, as well as coordinates the transfer of patients between facilities. However, these teams often have little pediatric expertise or experience. As a result of the National Commission on Children and Disasters (NCCD) report, the NDMS hired a medical officer specifically for pediatric care. The US Public Health Service Office of Force Readiness and Deployment requested funds for a pediatric team or additional pediatric training and exercises in 2011, but this request was denied (NCCD, 2010).

Basic medications and medical equipment were addressed in the NCCD report, including a need to increase pediatric supplies in the Strategic National Stockpile (SNS). There was also an emphasis on pediatric education for hospital ED employees, but no specific suggestions to include other units. There were also recommendations for better training and coordination with Emergency Medical Services (EMS) to improve pediatric pre-hospital care both in disasters and during normal periods of operation (NCCD, 2010). There also need to be improvements in agreements between facilities for the transfer of pediatric patients. Additionally, a national strategy is required to address the transfer of pediatric patients between facilities in a large-scale disaster (NCCD, 2010).

Disaster Standards

While many areas of pediatric disaster preparedness need improvement, some national guidelines exist to aid hospitals. The Joint Commission's (TJC) 2016 document "Emergency Management Standards Supporting Collaboration Planning" consists of 12 main standards. Focus areas include a hospital's Emergency Operations Plan, which should address the management and organization of communications, supplies and resources, security and safety, staff, utilities, patients, and volunteers in the event of a disaster. TJC offers eight considerations for hospitals, including alternate care sites, inter-hospital collaboration, coordination with community resources, and training. However, these are suggestions to help guide planning; they are not mandated. Throughout the document, children are only mentioned twice, once of which was in regard to providing support for the families of staff. Children are also included in one of the standards, as an example of a vulnerable population. However, there were no specific guidelines for the inclusion of children in disaster planning or response (TJC, 2016).

TJC standards provide specific information for training and drills. Every hospital is required to conduct two disaster drills yearly, one of which includes the involvement of the community. The document also includes incident command structure. While most organizations recommend the National Incident Management System (NIMS), TJC does not require this system. Facilities are free to select an Incident Command System (ICS) of their choice (TJC, 2016). Although this may appear more flexible for hospitals, it can complicate communication and planning between facilities.

Disaster Planning

Local, state, and federal governments have different roles regarding disaster preparedness and response. Ultimately, the local government is in charge and will seek additional resources

from state agencies if needed, and state level organizations will obtain federal resources if necessary. It is the responsibility of local governments to form disaster plans and coordinate with state and federal authorities during the planning stage, so that guidelines are in place should a disaster occur that requires resources beyond the capacity of the local government (FEMA, 2016).

Federal Planning

The Federal Emergency Management Agency (FEMA) is responsible for federal disaster preparation and response (FEMA, 2018b). In 2002, the Department of Homeland Security (DHS) was created, which includes FEMA and other agencies, such as the United States Coast Guard, Transportation Security Administration, and National Protection and Programs Directorate. The mission of DHS includes disaster resilience and the prevention of terrorism (DHS, 2017).

Although national agencies exist, there is an absence of a national preparedness strategy.

Without this, there are no clear goals or priorities for improvement. When there is a lack of goals and priorities, there is a lack of funding. Homeland Security established a grant program to assist states in addressing some of these gaps (NCCD, 2010). The program included suggestions for improvement, but did not require grantees to spend the funds on pediatrics. The committee recommended requiring the inclusion of pediatric surge capacity for grantees. The NCCD also included the importance of health care licensing organizations at the state and federal level in establishing guidelines (NCCD, 2010).

In 2009, however, FEMA established a group whose sole purpose was to improve upon the inclusion of pediatrics in federal, state, and local disaster plans. Although committees have been formed to address deficits in pediatric disaster preparedness, many of them are not permanent and may be eliminated by new administrations (NCCD, 2010). FEMA and the

Department of Health and Human Services (HHS) formed their own individual Children's Working Groups, which took on different roles within governmental agencies to assist in incorporating children into all phases of disaster planning and response (NCCD, 2010). NCCD recommendations were also made that pediatric training and exercises should have clear objectives and measures, but does not provide any examples or include if there are any standards. Furthermore, the group desired that Congress provide a yearly report on children and disasters, but it is not clear that this was ever carried out (NCCD, 2010).

State Planning

State level agencies coordinate with local and federal resources for disaster planning and response. In Missouri, for example, the State Emergency Management Agency planning consists of Emergency Human Services, Missouri Emergency Response Commission, the Medical Countermeasures Program, and other resources, and is also responsible for training and exercises (SEMA, 2018). The AAP (2006) recognizes preparedness as the most essential component of emergency management for healthcare facilities. Preparedness gives communities and governments the opportunity to coordinate and plan before disaster strikes, and includes drills and other training, as well as evacuation planning. Frequent meetings should be held among various groups for preparedness, in order to establish a baseline for communication and coordinate drills and other planning activities, including constant evaluation and restructuring of plans (AAP, 2006). Traditionally, children have been excluded in planning for terrorist events. One proposed reason for this is that preparation for terrorism has emphasized military readiness, and therefore, was focused on adults (AAP, 2006). The AAP (2006) stressed the need for a complete reworking of preparedness to include children and families.

Local Planning

Local governments coordinate with state and federal organizations, local Red Cross and Salvation Army chapters, and various local governmental agencies. As an example, the Office of Emergency Management (OEM) in St. Louis County, Missouri is responsible for creating a framework that aids in decreasing vulnerabilities to disaster and enhancing disaster response (OEM, 2018).

Emergency Departments (EDs) at the local level have a unique role in disaster planning. EDs are comprehensively involved in disaster preparedness, including the preparation and inventory of disaster supplies. They also perform the majority of triage, and need to have training and education on questions to ask to properly evaluate disaster victims. Although many hospitals conduct department or facility-wide drills, it is essential that hospitals also coordinate drills with other parties in the community, including EMS (AAP, 2006). The ED should be prepared to handle the surge in patients, while the PICU (Pediatric Intensive Care Unit) is expected to care for the most critically ill, who will likely make up a small percentage of the total number of patients. As part of surge preparation, the team must be aware of their surge capacity (Centers for Bioterrorism Preparedness Program Pediatric Task Force (CBPPPTF), 2008). During decontamination, children should never be separated from caregivers unless medically necessary. With large-scale infectious disease emergencies, caregivers and children will be separated due to potential need for admission at an appropriate facility. The health department will provide the case definition and will guide hospitals on screening and triage (CBPPPTF, 2008).

Along with the ED, hospitals have implemented disaster triage systems. For example, JumpSTART is primarily a pre-hospital triage system that focuses on resource and management changes once the victims arrive at a tertiary facility. Hospital triage focuses on the prevention of

over-triage and staff should be prepared to switch triage systems based on capacity and the current situation. In the event of a disaster, it is recommended that the ED establish different areas of care based on triage. Each of these areas has a leader who will maintain and supervise the flow of patients (CBPPPTF, 2008). Thus, triage programs and the ED are interwoven in the planning process of a disaster at the local level.

Disaster Training

Due to the lack of national standards for communities and hospitals, pediatric disaster training varies widely in both content and quality (NCCD, 2010). The National Commission on Children and Disasters (NCCD) was formed by Congress and the President in 2007 to identify areas for improvement in pediatric disaster preparedness and response. After identifying these gaps, the commission explored existing programs and opportunities for improvement. The group then made additional suggestions on areas for further development and presented their findings to Congress and the President in 2010. This report was the first comprehensive review of pediatric disaster preparedness (NCCD, 2010). There were several important outcomes from the NCCD review. First, the NCCD recommended that children comprise their own group, separate from that of “at-risk” populations. Second, a grant program was established to fund entities, primarily EMS agencies, to improve upon their pediatric disaster preparedness. Third, the report shed important focus on mental health during disasters. Fourth, the NCCD recommended the creation of pediatric core competencies (NCCD, 2010). Finally, while focus was on providing support for children affected both directly and indirectly by disasters, the review also included an emphasis on psychological support for those who would be working with children affected by disasters, especially those who do not typically work with children (NCCD, 2010).

Individual training in disaster preparedness is also critical, yet lacks structure. Those likely to respond to a disaster both in-hospital and throughout the community, such as registered nurses, EMTs, and physicians, should receive training to aid in the ability to provide adequate disaster response. The Centers for Bioterrorism Preparedness Program Pediatric Task Force (CBPPPTF) was formed in 2005 and consisted of various groups interested and experienced in pediatric disaster preparedness, including physicians, social workers, and emergency managers. The group was initially approached by the New York City Department of Health and Mental Hygiene to help improve pediatric preparedness in New York City Hospitals. The CBPPPTF met over a period of two years and focused on mass casualty preparedness for hospitals with an emphasis on pediatrics. Initially, emphasis was on hospitals without basic pediatric services, but later expanded to include all New York City hospitals. The CBPPPTF stated that all hospital staff likely to be involved in disaster response should receive training, but did not specify the type or frequency of training. They did include that emergency preparedness training should cover management and medical treatment of adults and children, but it was unclear if these trainings were mutually exclusive. The task force recommended that all nurses have Pediatric Advanced Life Support (PALS) and basic disaster training, in addition to participation in drills (CBPPPTF, 2008). PALS and basic disaster training courses are widely available. Thus, basic skills in emergency preparedness are generally defined and accepted, while being readily available.

CBPPPTF recommendations also included a Pediatric Emergency Care physician coordinator. This provider would be responsible for the knowledge and preparedness of staff physicians, as well as establishment and review of pediatric-specific medications and supplies that would be needed in a disaster. He or she would also ensure the inclusion of pediatric needs

in the hospital disaster plan, and serve as community liaison. In addition to ensuring physician preparation, this provider would also organize education for other providers in the ED. The Pediatric Emergency Care nurse coordinator would have a similar role, emphasizing nurse preparation. However, recommendations for these positions include a focus on education and preparedness for ED staff, while omitting other departments and providers who may be called upon in an emergency. If there is a disaster, all departments and staff will be affected. The group also recommended the establishment of an interdisciplinary pediatric disaster team, but did not address any educational or preparedness opportunities for units outside the ED (CBPPPTF, 2008). While the ED appears the place to start for hospital disaster preparedness, efforts should be made to include all staff and units throughout the hospital. Although the CBPPPTF made specific recommendations for improvements in community and local training, these were only recommendations. These suggestions were not followed with any federal or state legislation that defined implementation or assessed penalties for non-compliance. Therefore, the training programs for disasters within the US remain fragmented, uncoordinated, and poorly defined.

Research Questions

The disaster preparedness research study was conducted in a Midwestern Level 1 pediatric trauma hospital. For this study, register nurses (RN) were the unit of analysis. Registered nurses were surveyed on their perceived level of disaster preparedness. The survey, from a valid and reliable instrument, focused on personal and workplace preparedness, along with disaster experience and training. The specific research questions which guided this study were:

1. What is the level of preparedness among pediatric RNs?
2. Are there differences in preparedness between nursing units?

3. What factors influence preparedness among pediatric RNs?

Research Aims

The overall goal of this study was to determine the pediatric disaster preparedness of pediatric nurses in a single, Midwestern pediatric hospital. Using data collected from these registered nurses, the central hypothesis was that registered nurses are significantly unprepared for disasters. The specific aims of the study were:

Aim 1: To describe disaster preparedness among registered nurses and nursing units.

Aim 1a: To describe the disaster training among registered nurses in the pediatric hospital.

Aim 1b: To describe the disaster experience among registered nurses in the pediatric hospital.

Aim 2: To compare disaster preparedness between nursing units.

Hypothesis 2a: Disaster training will be highest among nurses in the ED, compared to other units in the hospital.

Hypothesis 2b: Disaster experience will be highest among nurses in the ED, compared to other units in the hospital.

Aim 3: To examine the association between individual, unit, and organizational characteristics associated with disaster preparedness among nurses in the pediatric hospital.

Hypothesis 3a: There will be an association between positive individual, unit, and organizational characteristics and disaster education among nurses in the pediatric hospital.

Hypothesis 3b: There will be an association between positive individual, unit, and organizational characteristics and disaster experience among nurses in the pediatric hospital.

Conceptual Model

This study used a conceptual framework based on the Bandura Theory of Self-Efficacy to explain the relationship between individual, unit, and organizational characteristics and disaster preparedness (Figure 3). The Theory of Self-Efficacy fits within the post-positivist paradigm. In this perspective, it is accepted that there are no absolute truths and researchers seek to determine the cause of a given outcome. The Theory of Self-Efficacy posits that efficacy expectations come from four main sources: performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal (Bandura, 1977). Performance accomplishments include one's personal experience accomplishing a given task. Vicarious experience describes situations where one can observe others successfully completing a daunting task, or hearing others speak about how they were able to accomplish something (Bandura, 1977). Verbal persuasion includes encouragement and other forms of support to help increase one's self-efficacy (Bandura, 1977). Emotional arousal influences the ability to perform in a high-stress situation (Bandura, 1977). Thus, self-efficacy is the belief that one has the ability to accomplish a given task.

For this project, the Theory of Self-Efficacy was applied to RN disaster preparedness. Performance accomplishments were conceptualized as prior disaster experience. Evidence suggests that prior nursing experience with correctly accomplishing a given number of tasks and successfully performing life-saving interventions may influence disaster preparedness (Arnold et al., 2009). In addition, level of education, as well as training and drills, was used to conceptualize vicarious experience. Previous participation in disaster response implies that the participant was

able to achieve some level of success in disaster-related tasks (Baack & Alfred, 2013; Lim, Lim, & Vasu, 2013). Verbal persuasion was conceptualized as nurse manager or staff nurse role. RNs who receive encouragement and other forms of support demonstrated increased disaster preparedness (Chapman & Arbon, 2008). Finally, this study conceptualized emotional arousal as department/unit type (ED or non-ED). For RNs with experience working in high-stress situations, it was expected they would be prepared for a disaster (Arnold et al., 2009).



Figure 3
Conceptual Model

Significance of Study

This research was the first study to focus on pediatric disaster preparedness among US nurses. This study had clinical, policy, and administrative significance. From a clinical perspective, understanding pediatric RN disaster preparedness is important for improving nurse awareness of disaster preparedness. If gaps in knowledge were found, education could be targeted to these areas, such as chemical, biological, radiological, nuclear, and explosive (CBRNE) events or decontamination, which could improve clinical competence. Nurses could participate in additional education and training and the survey could be administered again at a later date to help determine the effectiveness of the programs. The survey tool also evaluated personal preparedness. Nurses could either assist in educating the community about disaster preparedness, or if participants were found to lack personal preparedness, could participate in events in the community to improve upon their perceived weaknesses.

From a policy perspective, knowledge of RN disaster preparedness may provide additional information to policy makers that would assist in developing national or regional standards. There is a lack of national standards and guidelines regarding pediatric disaster preparedness in the US (NCCD, 2010). Numerous studies by researchers and government-funded teams have identified gaps in preparedness and offered suggestions for improvements. However, while there has been some progress, there are still many deficits. The results from this study could further emphasize the need for nursing education focused on pediatric disaster preparedness. The hospital of focus for the study is affiliated with a local nursing school. Hospital administration could discuss results of the study with school leaders and coursework could be developed to provide education on disaster preparedness. The school could also advocate for further education with national accrediting bodies. If the effectiveness of this

education is demonstrated, it could assist in establishing national guidelines for nursing schools. Likewise, the hospital could also work with accrediting bodies in developing guidelines and standards.

From an administrative perspective, a study examining pediatric RN disaster preparedness may aid hospital administrators in setting policy, guidelines, and training protocols for nurses and other clinicians. Without clear policies and requirements for pediatric disaster preparedness, hospital leadership is responsible for setting standards for their institutions. This study could aid administration in identifying gaps in knowledge and performance, as well as exploring attitudes about preparedness. Based on data analysis, future training may need to focus on a cultural shift in attitudes about disaster preparedness, or further support current beliefs.

Some training (such as personal/family preparedness) could be provided for all staff, while more specific education (decontamination and characteristics of biological events) would be unit-specific. The study emphasized both personal and workplace preparedness. Personal preparedness could be improved, and those receiving this education would serve as examples in the community. The hospital could work with community partners and provide education to the public via classes in the community or providing resources online. By improving the confidence and pediatric disaster preparedness of the nursing staff, it may also improve the community's perceptions of the facility and emphasize that children are seen as a vital part of the community.

Overview

Subsequent chapters will include a literature review exploring disaster preparedness, nursing, and self-efficacy. The theoretical framework for the proposed study will be discussed, as well as the rationale for choosing the Theory of Self-Efficacy. Research hypotheses and variables

Table 1
Disaster Terms and Definitions

Term	Definition
<i>Children</i>	Persons ages 0-18 years (NCCD, 2010)
<i>Disaster</i>	Sudden calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources (International Federation of Red Cross and Red Crescent Societies, 2018a)
	Occurs when hazards and vulnerability meet (WHO, 2002)
<i>Disaster preparedness</i>	Measures taken to prepare for and reduce the effects of disasters; to predict and, where possible, prevent disasters, mitigate their impact on vulnerable populations, and respond to and effectively cope with their consequences (International Federation of Red Cross and Red Crescent Societies, 2018a)
<i>Emergency</i>	State in which normal procedures are suspended and extra-ordinary measures are taken in order to avert a disaster (WHO, 2002)
<i>Hazard</i>	Natural or human-made event that threatens to adversely affect human life, property, or activity to the extent of causing a disaster (WHO, 2002)
<i>Mass Casualty Incident (MCI)</i>	Any incident in which emergency medical services resources, such as personnel and equipment, are overwhelmed by the number and severity of casualties (Louisiana Emergency Response Network, 2016)
<i>Preparedness</i>	Measures that ensure the organized mobilization of personnel, funds, equipment and supplies within a safe environment for effective relief (WHO, 2002)
<i>Response</i>	Set of activities implemented after the impact of a disaster in order to assess the needs, reduce the suffering, limit the spread and the consequence of the disaster, and open the way to rehabilitation (WHO, 2002)
<i>Surge capacity</i>	Ability of a hospital or other health care facility to expand quickly beyond normal services to meet an increased demand for medical care in the event of bioterrorism or other large-scale public health emergency (AAP, 2006)
<i>Vulnerability</i>	Diminished capacity of an individual or group to anticipate, cope with, resist and recover from the impact of a natural or man-made event (International Federation of Red Cross and Red Crescent Societies, 2018a)
	Predisposition to suffer damage due to external events (WHO, 2002)

will be explored. The methods chapter will include a discussion of research design, the instrument, and statistical analyses. Recruitment methods and inclusion and exclusion criteria will be examined. The results chapter will include study findings and data analysis and the discussion chapter will explore limitations, implications, and direction for future research.

Chapter 2: Literature Review

Overview

For this literature review, the following steps were taken to identify the salient literature. First, searches were conducted using the following databases: CINAHL, PubMed, and Web of Science. Search terms included “pediatric,” “hospital,” “disaster,” “emergency,” “preparedness,” “children,” “nursing,” and “self-efficacy.” Articles were limited to peer reviewed journals and the English language. Due to the sparse nature of the literature, articles were not restricted by date.

Second, abstracts and articles were scanned for relevance and duplicated articles were eliminated. Because so few articles addressed hospital-based nurses, disaster preparedness, and pediatrics, articles that focused on a combination of nursing, clinical emergencies/disasters, and pediatrics were included for analysis. Third, articles were grouped by similar topics and further analyzed to compare findings. As a result, 39 articles were included for final analysis.

Some articles covered more than one area, and therefore findings are listed in multiple sections. Individual characteristics were categorized into four topical headings, which included personal beliefs (n = 6); confidence and self-efficacy (n = 6); past experience (n = 2); and willingness to respond (n = 9). Personal beliefs included risk perception, social trust, availability of assistance, belief in weather alerts, importance (or non-importance) of personal preparedness, and attitudes toward community susceptibility to a disaster.

General hospital characteristics were explored in three articles, while one article specifically addressed the hospital location and two discussed the influence of the type and size of hospital on disaster preparedness. Organizational characteristics that could influence disaster preparedness were discussed in numerous articles. Six articles addressed

administration/leadership, four discussed staffing, nine mentioned workplace training and education, two covered decontamination, six addressed drills, and two explored the role of nursing in facility preparedness.

This chapter is organized as follows:

1. A review of the literature describing RN disaster preparedness in the acute care setting
2. A review of the literature comparing RN preparedness between departments in the acute care setting
3. A review of the literature examining the relationship between individual, unit, and organizational characteristics associated with RN disaster preparedness
4. Gap analysis

Individual Characteristics Associated with Disaster Preparedness

Many characteristics influence one's personal disaster preparedness, including family emergency planning and presence of emergency kits at home (NCDP, 2018; Thomas, Leander-Griffith, Harp, and Cioffi, 2015). Personal beliefs, confidence and self-efficacy, past experiences, and willingness to respond will be discussed.

Personal Beliefs

Personal attitudes and behaviors influence disaster preparedness (National Center for Disaster Preparedness (NCDP), 2018). The NCDP (2018) surveyed Americans and found that 60% believed help would arrive within several hours of a disaster, and family emergency planning has declined over the past decade. Najafi, Ardalan, Akbarisari, Noorbala, and Jabbari (2015) found risk perception and social trust to influence disaster preparedness behaviors. Thomas et al. (2015) determined that those who believed in the effectiveness of preparedness were up to 30% more likely to demonstrate preparedness behaviors. Those with higher levels of

risk perception were more likely to have emergency kits at home (Thomas et al., 2015) and higher overall levels of preparedness (Bürgelt, Paton, & Johnston, 2009; Hoffmann & Mattarak, 2017). Bürgelt, Paton, and Johnston (2009) conceptualized preparedness as the presence of adequate food and water, resilience to loss of electrical power, presence of first aid supplies, presence of camping equipment, and ability to acquire medications. While these studies were not conducted with healthcare workers, the findings can be explored in the context of studies involving healthcare workers.

Personal Beliefs Among Clinicians

Baumann (2014) conducted a hermeneutic study in 2013 with nurses who were affected by Hurricane Sandy. The participants were members of a graduate nursing program and were required to write a reflection on “weathering the storm.” The 16 students who consented had their reflections included in the study. All were working as nurses in unspecified units in various New York City hospitals during the storm. Many worked long shifts and spent several nights at their respective hospitals. Most of the participants had been in New York during other storm warnings. These other storms did not become as severe as predicted, and therefore staff were skeptical of the warnings for Hurricane Sandy. Several challenges occurred when reporting to work due to conditions at home, such as damage to homes and neighborhoods, which required personal coordination with their families. Themes included “the unfolding situation,” “moving with the familiar-unfamiliar,” “human nature gleams in the darkness,” “the city that never sleeps gets a rest,” and “who they are and what nurses do.” The findings from this study suggested that nurses may need to be adequately prepared on a personal level for disasters (Baumann, 2014).

In a study of hospital and medical school employees, Brice, Gregg, Sawyer, and Cyr (2017) assessed the personal preparedness of 1,235 participants at a single hospital and affiliated

medical school in North Carolina in 2007. This study included 306 nurses, 219 registration/clerical staff, 208 physicians/advanced practice providers, 177 managers, 138 support personnel, 135 clinical support staff, and 52 nursing assistants. Participants completed an online questionnaire in English, or a paper copy in Spanish. Questions addressed willingness to report to work following various types of disasters, as well as knowledge of workplace disaster plans and personal/family plans and preparedness. Less than half (44.5%) of the employees were found to be sufficiently prepared for a disaster, with deficits in both emergency supplies and/or a family disaster plan. Only 32% had a complete family disaster plan, while 14.7% of participants were fully prepared for a disaster. Insufficient water was the most common reason participants were not classified as fully prepared. The authors concluded that personal preparedness did not impact the decision to report to work in a disaster (Brice et al., 2017).

Mitchell, Kernohan, and Higginson (2012) conducted a study with 50 ED nurses across three different EDs in Ireland to identify gaps in knowledge regarding CBRNE events. A 40-question survey was completed by participants and addressed knowledge, skills, and attitudes regarding CBRNEs. The researchers found that only 12% of participants were able to identify the correct triage system, while 42% had no experience setting up the decontamination tent, and 86% had no training on blast injuries (Mitchell, Kernohan, & Higginson, 2012). Six main areas for future education and training were identified by the authors: waste management, triage, decontamination, personal protective equipment (PPE), PODs (point of dispensing site), and chain of command. The authors recommended national guidelines for CBRNE competencies for healthcare workers (Mitchell et al., 2012).

Whetzel, Walker-Cillo, Chan, and Trivett (2013) surveyed 177 ED nurses in the US who were attending an Emergency Nurses Association conference in New Jersey. Participants

completed a 56-question survey that was developed for the study. Nearly all (97.7%) participants believed their facility had a disaster plan, but 21.5% had not read it, and 9.1% were unsure where to find the plan. While 80% of participants worked in a facility that treated both children and adults, only half felt comfortable caring for pediatric patients. The authors recommended an educational focus on local risks and hazards to help reinforce the belief in the community's susceptibility to a disaster (Whetzel et al., 2013).

Rassin et al. (2007) conducted a study in Israel of 46 physicians and 58 nurses, all of whom practiced in the same ED in a trauma hospital. Participants completed a 41-question survey developed for the study. The survey included demographic questions, as well as items addressing the care of children in a mass casualty event (MCE). The authors found a lack of educational programs to address provider coping in such an event and an overall knowledge deficit in pediatric mass casualty events (Rassin et al., 2007). Results indicated that participants felt much more prepared to care for adult than pediatric patients in an MCE. The authors addressed these concerns by recommending that the care of pediatric patients in MCEs be addressed in emergency planning and that hospitals have a crisis response team consisting of pediatric healthcare providers. In addition, employees should receive training and resources on coping with pediatric patients during an MCE (Rassin et al., 2007). Rassin et al. (2007) and Smith and Hewison (2012) both emphasized the importance of healthcare workers (HCWs) understanding and accepting the risk of disaster, which must happen for training to be effective.

Several misconceptions were also found in the literature. Despite evidence to suggest otherwise, many HCWs believe that patients will arrive at the hospital already decontaminated (Mitchell et al., 2012). Additionally, three other groups of researchers found that many HCWs do not believe there is a true risk of disaster in their communities. A group of ED nurses in the US

nearly unanimously agreed that a terrorist event would occur in the US, but less than half felt they would be a target, and over one third incorrectly believed the government would provide supplies and staff (Whetzel et al., 2013).

Confidence and Self-Efficacy

Confidence and self-efficacy have been shown to impact one's disaster preparedness. Higher levels of self-efficacy have been found to positively influence behavior change (Marceron & Rohrbeck, 2018). Those with low levels of self-efficacy often view risks as something that cannot be overcome, and as a result, do not take action to mitigate or prepare for risks (Marceron & Rohrbeck, 2018). Marceron and Rohrbeck (2018) found that high levels of self-efficacy, along with perceived risk, positively affected one's emergency preparedness. Ejeta, Ardalan, and Paton (2015) conducted a literature review supporting the positive correlation between self-efficacy and emergency preparedness. Thomas et al. (2015) also found that self-efficacy impacted the presence of both written disaster plans and emergency supply kits. Self-efficacy was also found to be the most influential factor in the willingness of volunteers to respond to a disaster (Ejeta, Ardalan, & Paton, 2015). Bürgelt, Johnston, and Paton (2009) determined that higher levels of self-efficacy positively influenced one's likelihood to be involved in community disaster/emergency preparedness.

Of the reviewed articles, three addressed confidence and two specifically explored self-efficacy. Confidence and self-efficacy are related concepts with different methods of assessment. Confidence refers to the strength of a belief, but does not specifically address to what the confidence or certainty refers. Self-efficacy specifically addresses one's belief that one can achieve a given task (Bandura, 1997). Ahayalimudin and Osman (2016) surveyed 194 healthcare workers (nurses, doctors, and assistant medical officers) in Malaysia regarding their disaster

knowledge, attitude, and practice, using stratified random sampling and a quantitative, cross-sectional survey. They found a positive correlation between training and prior disaster experience and level of confidence in disaster management for ED staff. In addition, disaster education was found to particularly benefit nursing knowledge and attitudes regarding disaster preparedness.

Lim, Lim, and Vasu (2013) conducted a study with 1,534 healthcare workers in Singapore. Of the total number of participants, 1,152 were nurses (physicians and allied health professionals made up the remaining 382 participants), with 128 being employed in the ED. The authors examined the healthcare workers' perceptions of the following: institutional and individual disaster preparedness, prior disaster experience, and MCI knowledge and training. Only 19.8% had participated in disaster preparedness training during the two years prior to the study and only 27.8% were aware of how to access training opportunities. The authors found that HCWs at hospitals which had experienced Severe Acute Respiratory Syndrome (SARS) and H1N1 pandemics and also had regular training exercises were more confident that their facility could adequately respond to a disaster (Lim, Lim, & Vasu, 2013). Several factors were found to impact participants' perceptions of both their individual and institutional preparedness: leadership, prior experience, training, and family and peer support. Prior disaster training and the belief that peers were knowledgeable about their institution's plans increased confidence in individual and institutional preparedness.

Arnold et al (2009) surveyed 40 non-ED nurses to evaluate the effectiveness of simulation on self-efficacy and performance in emergency response. They used both the Emergency Response Performance Tool (ERPT) and the Emergency Response Confidence Tool (ERCT) for the study. The ERPT was based on Advanced Cardiac Life Support (ACLS) clinical

guidelines and assessed the correct performance of skills during a simulated cardiac event. The ERCT was a self-assessment of the participant's confidence in performing the required skills. While the scenario was a clinical emergency, not a disaster, the team found that confidence, experience, and knowledge were positively correlated. Groups consisted of nurses with greater than ten years of critical care experience (Group 1), nurses with less than 13 months of critical care experience (Group 2), and no critical care experience (Group 3). Critical care nurses scored higher in confidence and knowledge than medical-surgical nurses. The average confidence percentage for Groups 1, 2, and 3 was 96%, 90%, and 61%, respectively, while knowledge test percentage was 86% for Group 1, 84% for Group 2, and 51% for Group 3. The authors proposed this finding was likely due to the different training requirements when nurses were assigned to specialized hospital units (Arnold et al., 2009).

Melnikov, Itzhaki, and Kagan (2014) examined the intention of 243 Israeli nurses to report to work during a disaster or other emergency. Participants worked in various inpatient hospital units, including medicine, surgery, intensive care, gynecology, oncology, emergency medicine, and pediatrics, as well as outpatient clinics. A pilot study was conducted to assess the questionnaire to be used and several adjustments were made. Participants completed the revised questionnaire, consisting of eight categories: intention to report, barriers, self-efficacy, perceived risk, knowledge of role, institutional support, previous experience, and demographics. Factors that were found to influence nurses' intention of reporting to work included the availability of childcare, transportation, and personal health concerns. Nurses with prior disaster experience demonstrated higher levels of self-efficacy, and those with higher self-efficacy reported a greater willingness to report to work during a disaster (Melnikov, Itzhaki, & Kagan, 2014).

Ben Natan et al. (2014) used the General Self-Efficacy Scale to evaluate 300 nurses and nursing students in Israel and their willingness to report to work during an earthquake. All participants were based in hospitals, but the hospital unit was not specified. The tool consisted of 51 items divided among six parts: demographics, Generalized Self-Efficacy Scale, training and experience, earthquake knowledge, attitudes, and willingness to work (Ben Natan et al., 2014). Self-efficacy, experience, knowledge and training, and multidisciplinary support were identified as the four main factors influencing the willingness to respond (Ben Natan et al., 2014). Nearly half (49.6%) of participants reported confidence in coping with an earthquake, while 42.4% would try to report to work after an earthquake. Overall, participants had little experience with MCIs, although nurses reported more experience than nursing students (Ben Natan et al., 2014). Additional factors contributing to higher levels of self-efficacy were an adequate understanding of the nurses' roles and expectations during disaster and overall disaster knowledge (Melnikov et al., 2014). A positive correlation was also found between knowledge, self-efficacy, and coping during disaster.

Martins et al. (2017) conducted a study examining the effect of simulation on self-confidence regarding performance during emergencies. Participants consisted of 162 nursing students enrolled in an Emergency Nursing course. Pre- and post-testing was conducted using demographics, the Self-Confidence Scale, knowledge testing, and a practical assessment. The focus was on adult and pediatric emergencies. Self-confidence scores rose 10% after the simulation education. Nursing students who reported high levels of self-confidence were more likely to perform successfully in a given situation. Practice and simulation are two interventions that have increased the probability of a successful response in an emergency situation. Simulation was found to significantly increase self-confidence when responding to an

emergency, and also aided in complementing education. Knowledge alone can provide nurses with falsely elevated self-confidence, and simulation helps bridge the gap between knowledge and action (Martins et al., 2017).

Overall, the literature on confidence and self-efficacy suggests a positive correlation between training, prior disaster experience, and level of confidence in disaster management at one's facility. Disaster training, education, and simulation exercises positively influenced knowledge, attitudes, and self-confidence regarding disaster preparedness and response. Prior disaster experience increased self-efficacy, which thereby increased the willingness of one to report to work during a disaster.

Past Experience

Najafi et al. (2015) determined that previous disaster experience was one of four factors to positively influence disaster preparedness behaviors among Iranians. The authors had several theories including that those with previous disaster experience may be more likely to seek out additional preparedness information and guidance, and had an increased likelihood of acknowledging risk (Najafi et al., 2015). Hoffmann and Muttarak (2017) found previous disaster experience to positively influence preparedness actions. Participants who had experienced disaster within the last three years in the Philippines were 2.8 times more likely to be prepared, while those in Thailand were 2.7 times more likely (Hoffmann & Muttarak, 2017).

Arbon et al. (2013) explored the willingness of 41 ED nurses in Australia to report to work during a disaster. Both group and individual interviews were conducted, and three main themes were determined during data analysis: uncertainty, disaster preparedness, and choice. Uncertainty addressed both the type of disaster and the potentially unknown risk of the disaster. Participants felt they should have a choice of reporting to work. Those nurses with less

experience tended to follow the example of experienced coworkers (Arbon et al., 2013). Previous disaster experience was positively correlated with overall feelings of preparedness (Arbon et al., 2013; Baack & Alfred, 2013). ED nurses who felt unprepared for disaster reported discomfort discussing their concerns with managers or coworkers.

Baack and Alfred (2013) conducted a study with 620 nurses employed in Texas, in which approximately 20% were critical care or ED nurses. The Disaster Readiness Questionnaire, consisting of 58 items, was used to assess disaster preparedness and perceived competence. Overall, there was a low level of perceived competence. The authors found that those who had personally participated in a disaster or worked in a shelter following a disaster had higher levels of perceived confidence regarding preparedness.

The authors who have investigated past participation found that previous disaster experience was positively correlated with an overall feeling of, and perceived confidence regarding, disaster preparedness.

Willingness to Respond

In a comprehensive review, Ejeta, Ardalan, and Paton (2015) found that a higher perceived self-efficacy was positively correlated with a willingness to respond.

Brice et al. (2017) conducted a cross-sectional survey of 1,235 employees at a single hospital in North Carolina. Participants included both clinical and nonclinical staff. Researchers used the Citizen Assessment of Readiness for Disaster—Employee Survey to assess individual disaster preparedness and the relationship between personal preparedness and willingness to respond in a disaster. The authors categorized 59.2% of participants as well or fully prepared. Full preparedness was found to be significant only in the event of an MCI (Brice et al., 2017). However, while those fully prepared were more likely to respond, those classified as well-

prepared had a negative correlation with response. The type of disaster impacted employees' willingness to report to work. During a natural disaster, 52.7% of participants stated they would report to work, while only 37.2% would do so in the event of a chemical, biological, or radiological event (Brice et al., 2017).

Nurses with greater knowledge and self-efficacy were shown to have a higher intention of reporting to work during a disaster (Melnikov, Itzhaki, & Kagan, 2014). Some nurses felt they should be able to choose whether to report during a disaster, without fear of retribution (Arbon et al., 2013).

Bell, Dake, Price, Jordan, and Rega (2014) surveyed 332 ED nurses in the US. The authors used the Protection Motivation Theory to develop an instrument to assess the willingness of ED nurses to report to work during an Avian flu pandemic and found that 84% of ED nurses were "likely" or "very likely" to report, while only 61% believed their coworkers were "likely" or "very likely." Nurses felt confident in their knowledge of PPE (97% of participants) and named the following factors influencing their likelihood of reporting to work: concern over infecting their families, possibility of quarantine, and the fear of becoming infected (Bell et al., 2014).

In a study of HCWs, Burke, Goodhue, Chokshi, and Upperman (2011) surveyed 877 healthcare workers (252 of whom were nurses) in the US and found that only 47% were willing to respond in a disaster, with men and physicians more willing than women and nurses, respectively. Participants completed a 24-item survey, which included demographics, disaster experience, and training. The more dependents a participant had, the less willing they were to report in a disaster. Those who lived further from the facility were also less willing to respond. While personal preparedness was found to influence willingness to respond, experience and

training was not shown to have an impact on the decision. Higher levels of knowledge, awareness, confidence in their roles, and duties during disaster positively influenced nurses' willingness to respond (Melnikov et al., 2014).

Burke, Iverson, Goodhue, Neches, and Upperman (2010) made recommendations on how hospitals could integrate pediatrics into their disaster plans. They had five areas with specific recommendations: planning, practice, preparation, partnerships, and family reunification. Children should be incorporated in all plans, specifically involving the safety and protection of children until they can be reunited with their families. They recommended at least 15-20% of victims in drills be pediatric patients. For preparation, appropriately sized equipment should be readily available, and staff should receive training in pediatric triage and medications. Pediatric-specific disaster education could increase the willingness of medical personnel to respond during a disaster. Partnerships could focus on surge capacity and pre-established relationships with community resources, hospitals, and other agencies. Family reunification emphasized the importance of maintaining the safety and protection of children, especially those without guardians present (Burke et al., 2010).

Another contributing factor was personal preparedness. Nurses who felt their families were well-prepared were more willing to report. However, those with more dependents and those who lived long distances from the hospital reported decreased willingness (Burke et al., 2011). Bell et al. (2014) had similar findings as factors decreasing willingness to report included concern over exposing family and friends to an infectious agent, being away from family for long periods of time, and fear of dying.

Smith and Hewison (2012) explored willingness to respond to a bioterrorism event. Nurses indicated greater willingness to report if it was a known biological agent, and were

directly influenced by their knowledge of biological agents (Smith & Hewison, 2012). Other researchers had similar findings, indicating that preparedness and training had a direct impact on nurses' willingness to report (Goodhue et al., 2013). Goodhue et al. (2013) discussed the importance of including children in disaster planning. One reported barrier to adequate training was staffing shortages. Due to inadequate staffing, management was unwilling to send staff for training or continuing education or to participate in or conduct drills.

In summary, the literature on willingness to respond suggests that greater knowledge, self-efficacy, confidence, and personal preparedness positively influence willingness to respond, although one study found that experience and training did not impact willingness. More healthcare workers were willing to respond during a natural disaster than a CBRNE event. In a bioterrorism event, more were willing to respond if it were a known biological agent. One team found that men and physicians were more willing to respond than women and nurses. Increased distance from work and a higher number of dependents decreased the likelihood that one would report to work in a disaster.

Unit Characteristics Associated with Disaster Preparedness

The healthcare literature suggests that unit characteristics within the hospital may be related to disaster preparedness by staff. Education and training conducted at the unit level may positively influence the level of staff disaster preparedness. Ratnapalan et al. (2013) conducted a retrospective study of H1N1 management at a Canadian hospital during the H1N1 pandemic. The reflections focused on communication, infection control, microbiology, physician deployment, nursing, and hospital functioning. One nursing factor that impacted adequate response was the inability to effectively float nurses from other units. The particular facility used in the study did not have float pool or other nurses who were trained in the ED. Therefore, nurses

from other units who were sent to the ED were essentially nonfunctional. The nurses were not familiar with the ED, typical ED procedure, nor the location of supplies and equipment (Ratnapalan et al., 2013). Not only does this alter staffing because it appears that there are adequate numbers, but it could also actually impede care if ED nurses are being asked to assist those who were sent to help.

Reilly and Markenson (2009) surveyed 24 American hospitals to examine education and training and identify those staff members considered essential during a disaster. Respondents were bioterrorism coordinators and/or emergency managers at participating facilities. ED nurses were listed as one of the three essential categories of staff, along with ED physicians and ED support staff. However, some participants indicated that these essential staff had not received training on their hospital's emergency plans. Outpatient nurses received the most emergency training (34.7%). While many essential staff had not received training, the State Health Department has free training available at the request of facilities. While systems exist to organize and respond during a disaster (Hospital Incident Command System), participants did not appear to use them. The authors concluded that all nurses should receive education at their hospital regarding their roles and responsibilities during a disaster. If this occurred, then nurses from other units would find it easier to assist in the ED or in other atypical roles should a disaster occur. The authors found that many of the hospital administrators were not compliant with national recommendations and made independent decisions about essential personnel (Reilly & Markenson, 2009).

Sonneborn, Miller, Head, and Cross (2018) conducted a study on disaster preparedness and education among 53 Operating Room (OR) staff in Australia that included registered nurses, Clinical Nurse Specialists, enrolled nurses, associate charge nurses, and floor coordinators. A

disaster questionnaire originally used for ED nurses was used to assess disaster knowledge and preparedness in the acute care setting. The aim of the study was to determine knowledge of one's role in a disaster and the type of disaster training and education desired by participants. The authors discussed the importance of training all staff, and not just ED nurses or other nursing staff. Most of the participants (81.1%) had not been involved in a previous disaster, and only 51.9% felt confident to perform their role in a disaster. When considering disaster education during the previous 12 months, 42% of ED staff had not completed such training, while only 22.6% of OR nurses lacked this education. No significant correlations were found between general knowledge and training, age, or experience (Sonneborn et al., 2018).

Among the authors who have explored education and training, the findings suggest that education and training at the unit level may positively influence the level of preparedness. A lack of float pool and other crossed trained staff negatively affected the preparedness of the hospital.

Location of Facility

Based on the literature, the location of the facility may be associated with disaster preparedness. Hodge, Miller, and Skaggs (2017) explored preparedness at a rural hospital in Ohio. The aim of the study was to assess the perceived disaster preparedness of 307 nurses at a single facility via a survey. Participants included RNs, licensed practical nurses (LPNs), and advanced practice registered nurses (APRNs). While 40% of participants stated they would be less than effective in the event of major disaster, three main areas of concern were raised: preparedness terms and activities, triage ethics, and the assessment of critical resources. ED nurses were found to be more familiar with preparedness than other units, although specific statistics were not provided. The authors emphasized the importance of prepared nurses who can function well during disaster, as that will influence the ability of the hospital to respond

effectively. Nursing preparedness is especially important in rural communities, as they are typically isolated and lack the staffing and supply resources available in urban areas (Hodge, Miller, & Skaggs, 2017).

Type and Size of Facility

The type and size of a healthcare facility may impact disaster preparedness. In 2011, a full-scale exercise involving three major hospitals in Los Angeles was conducted. The exercise was a simulated earthquake and the staff from three hospitals participated. A 13-item quantitative survey was completed by 20 participants (ten nurses and ten non-clinical staff). Semi-structured interviews were conducted with nine, although it is unknown how many, if any, of the same participants completed both the quantitative and qualitative portions of the study. Only 55% knew their role according to their facility's disaster plan. A number of issues were raised in the qualitative interviews. Participants desired more pediatric training, and many did not know how to use the radios even though just-in-time training was provided before the exercise. Nurses in a Level 1 pediatric trauma center did not feel prepared to handle pediatric victims during a disaster, and staff from non-pediatric hospitals requested additional pediatric training. The authors recommended training in pediatric disaster triage, such as JumpSTART, as nurses in the study did not transition to disaster triage. Rassin et al. (2007) also found a low level of pediatric preparedness among ED physicians and nurses, especially when faced with chemical or radiological events. In addition, pediatric disaster victims present unique challenges, and healthcare workers may have a difficult time coping. Unfortunately, little education exists to assist HCWs with this difficulty (Rassin et al., 2007).

The type and size of facility may also affect available resources and the capacity to effectively manage various disasters. Smit et al. (2017) studied the response of U.S. hospitals to

the Ebola outbreak. Initially, the Centers for Disease Control and Prevention (CDC) recommended all hospitals be able to care for Ebola patients. However, this was modified to focus on certain hospitals so that resources could be consolidated. The study included 222 general hospitals from 45 states and the District of Columbia. Larger hospitals were able to spend more money on preparedness training and supplies. While many hospitals obtained the needed supplies to treat Ebola patients, over half (55%) of the participating facilities did not budget for the necessary equipment to remain prepared in the future. Some challenges were reported, including 83% of hospitals which reported supply shortages from vendors and 67% experienced staff anxiety and fear. However, 86% perceived value in preparing for Ebola, including improved PPE, better triage screening, and better preparation for other infectious diseases. While perceived value was positively correlated with hospital size, no association was found between perceived value and amount spent on supplies (Smit et al., 2017).

This literature suggests that facility type and size may be important in the level of disaster preparedness. Larger facilities were able to spend more money on disaster training and supplies. However, even staff in larger hospitals desired more pediatric training and expressed concern with personal coping when working with pediatric disaster victims.

Organizational Characteristics Associated with Disaster Preparedness

Administration/Leadership

While hospital leadership and administration are vital during emergencies, it is also essential that these leaders support drills and disaster preparation. Without their support, drills are not as effective. Often, larger drills involving multiple units and additional personnel are not prioritized. In addition, it is also important to have buy-in from senior leadership, so that others can follow their example and understand the benefits of conducting drills (Farra et al., 2017). An

analysis by Clancy and Kacica (2012) revealed the importance of a pediatric nurse coordinator, who would act as an advocate for pediatric-specific aims in facility disaster preparedness and training. In their study of 116 New York hospitals, they found that facilities with a pediatric nurse coordinator were more likely to include pediatrics in their disaster plans, have a plan for unaccompanied minors, and have the proper equipment required to effectively treat children.

Boyer, Fitch, and Shannon (2009) wrote a report for the Agency for Healthcare Quality and Research, covering challenges related to surge, emergency preparedness guidelines, and hospital and employee responses to disasters. Surveys consisted of ten questions related to pediatric preparedness and were administered to hospitals in New York, with 116 surveys included in analysis. Nearly all (91%) of the facilities had nurses with pediatric expertise, and 84% had plans to house pediatric patients, but only 65% of facilities had emergency plans specifically addressing the needs of children if transport to other facilities was unavailable. Facilities that had a pediatric nurse coordinator were three times more likely to have plans specifically addressing the assessment and treatment of pediatric patients. The authors discussed the role of the nursing administrator, whom they stated was responsible for all nursing-related activities during a disaster, including patient management. The administrator would also ensure adequate numbers of ED nurses to provide care, and would obtain more staff if necessary (Boyer, Fitch, & Shannon, 2009).

Arbon et al. (2013) found three main issues of concern for ED nurses: safety, communication, and duty. Safety concerns applied both to the nurses' families and their own personal safety during a disaster. If nurses felt like they had the PPE and other safety measures in place, they were more willing to respond, while feelings of distrust in their hospital decreased the likelihood of response. Distrust came from either inadequate disaster plans, poor

communication/training regarding the plans, or inconsistent information. Knowing that some disasters may keep nurses at the hospital for extended periods of time, having the ability to communicate with their families influenced their willingness. One factor that positively influenced willingness was a sense of duty to the nursing and healthcare profession.

Confidence in leadership's ability to respond also positively influenced overall confidence in preparedness. The authors specifically addressed participants' feelings of confidence in their administrators' ability to lead an effective response in the event of a disaster. In addition, peer support programs and believing in the adequate preparedness of colleagues increased feelings of confidence regarding disaster preparedness and response (Lim et al., 2013).

Hoying, Farra, Mainous, Baute, and Gneuhs (2017) examined the role of leadership in disaster management. A survey was conducted among hospital leadership at a midwestern pediatric hospital to determine gaps, which were then used to establish objectives for a training program. The focus of the training was on crisis leadership, while post-training assessment emphasized leadership style, situational awareness, and the ability to implement the Emergency Operations Plan (EOP) and differentiate team member roles. The goal was to expand the training to other hospital staff (Hoying et al., 2017).

Overall, the research on the role of administration and leadership suggests that for successful disaster preparedness and response, the administration must "buy in" to the importance of preparedness. Staff distrust came from inadequate plans and poor communication and training. Staff who demonstrated confidence in their leadership's ability to respond effectively in a disaster had higher overall confidence in preparedness.

Staffing

Staffing is a concern during disaster because effective response may require additional personnel. Although ED nurses have been identified as essential personnel, hospitals may have to rely on other nurses to help staff the ED. For example, outpatient nurses were trained in disaster response and would be called upon during surge (Reilly & Markenson, 2009). When the H1N1 pandemic occurred, an urban pediatric hospital opened an additional treatment area, which only required one extra nurse (Charney, Armbrecht, Kennedy, & Flood, 2012). While this worked well in that situation, the staffing required would depend on the type and scale of disaster.

The unpredictable timing of disasters means that ED nurse staffing is an on-going concern. Goodhue, Lin, Burke, Berg, and Upperman (2013) discussed the importance of baseline adequate staffing. When units are understaffed, they are less likely to conduct drills and send ED nurses for disaster training (Reilly & Markenson, 2009).

Campion et al. (2016) examined the response to a plane crash and how staffing was affected in the immediate aftermath. Twelve hospitals received patients from the crash, but one trauma hospital received 63 of the injured passengers, including ten who were critical. In response, nurses alone logged 370 hours of overtime in the first 18 hours after the crash. Nurses were primarily shared between the ED, ICUs, hospital wards, and the Operating Room (OR). The response highlighted the importance of planning for inpatient surge (Campion et al., 2016).

Workplace Training and Education

ED nurses were found to be one of three essential groups of personnel for disaster preparedness and response. Other essential personnel were ED physicians and support staff. Although recognized as essential members of response, some of these nurses had not received

any training regarding their role in their facility's disaster response plans (Reilly & Markenson, 2009). Nurses will assume many roles and tasks during a disaster. Some of these are typical roles for ED nurses, with some modifications and challenges.

Burke, Kim, Bachman, Iverson, and Berg (2014) conducted a mixed methods study of 20 HCWs (ten nurses and ten non-clinical staff) to assess pediatric disaster preparedness in the hospital setting. The team found that many staff did not know how to use the radios and that triage nurses did not switch from their normal triaging system to disaster triage.

Mitchell, Kernohan, and Higginson (2012) found that many triage nurses were unable to identify signs of biological and chemical agents. Bölenius, Vestin, Saveman, and Gyllencreutz, (2017) developed a questionnaire to assess the preparedness of 35 pre-hospital emergency nurses in Sweden in caring for pediatric trauma patients. The questionnaire consisted of 38 items and included topics such as demographics, experience, practice, stress, knowledge, and readiness. Content validity and internal consistency were supported through statistical analysis. High or very high levels of trauma education were reported by 81% of participants, although 60% stated that MCIs were not included in their trauma education, and 80% felt that additional training for pediatric trauma patients would improve care (Bölenius et al., 2017).

Hodge, Miller, and Skaggs (2017) surveyed 307 nurses in a rural American hospital to assess their perceived disaster preparedness. Nurses desired education in disaster terminology, disaster ethics, and how to access resources (Hodge et al., 2017). While the ED nurses who participated were more familiar with disaster preparedness than nurses from other units, they still had concerns (Hodge et al., 2017). Mitchell et al. (2012) found that some ED nurses had not received any training in the set-up of the decontamination tent or blast injuries and identified six key focus areas for future CBRNE events education: waste management, triage,

decontamination, PPE, point of dispensing sites (PODs), and chain of command (Hodge et al., 2017).

Li, Turale, Stone, and Petrini (2015) interviewed 15 nurses (13 of whom were OR nurses) in China about their experiences working following an earthquake. The main theme was “turning into a strong nurse.” This theme was broken down further into three stages: going to the disaster, immersing into the disaster area, and trying to let disaster experiences fade away. The nurses did not feel they had the knowledge and skills to respond, were not prepared before leaving, and did not have proper follow-up for psychological concerns. Participants felt that disaster education should be incorporated into nursing programs, but also available for currently practicing nurses (Li et al., 2015).

Becker and Middleton (2008) conducted focus groups with ED physicians and nurses in the US. The aim of the study was to determine concerns regarding radiological events. Participants (44 of the 77 were ED nurses) raised six main factors for concern: the hospital becoming overwhelmed, family safety, staffing, not being prepared, contamination, and personal safety. Nurses reported training in some CBRNE events, but were specifically lacking in radiological training. Approximately one-third (33.8%) of participants were concerned that family issues could affect staffing in a radiological event, while 26% felt uncertain about PPE, and 31.2% reported minimal or no radiological training at their facility.

Fox and Timm (2008) surveyed 45 nurses (35 of whom responded to the two-year follow-up) regarding their views and experiences with education for pediatric patients and disaster preparedness. Participants voiced a lack of educational programs for non-ED nurses. Education and training are vital to disaster preparedness, but continued training is essential. Pediatric disaster knowledge increased after a training program, but after two years, knowledge

levels were similar to the original pre-test (although specific statistics were not available), indicating that facilities should provide ongoing educational opportunities for staff. The training program was developed using national statements and included the following topics: definitions, weapons, pediatric-specific considerations, and agencies and organizations (Fox & Timm, 2008). Disaster education and training were found to increase both confidence and disaster readiness (Ahayalimudin & Osman, 2016). Even though training is available for free from some state departments, few hospitals take advantage of these opportunities, indicating that funding is not the only barrier to training (Reilly & Markenson, 2009). In addition, many skills learned in bioterrorism training are applicable to infectious diseases and other tasks, further supporting the need for disaster education.

Thus, the workplace training and education literature suggests an overall lack of adequate disaster training and preparation. Deficits were demonstrated regarding training with facility plans, use of radios, switching from normal to disaster triage, radiological emergencies, training of staff outside of the ED, and continuing education opportunities.

Decontamination

The need for decontamination of patients to remove toxins may play a critical role in staff preparation for a disaster. Timm and Reeves (2007) observed a mass casualty drill involving chemical decontamination. In the scenario, there were 53 children and three adult victims. When considering the decontamination of patients, this task is usually directed to ED staff, and they are frequently the only personnel with decontamination training. However, by using the ED staff for decontamination, there is a decreased number of ED staff to provide patient care. The decontamination team should include staff outside the ED, and could include non-clinical staff. These actions would allow for trained clinical staff to provide patient care in their area of

expertise. The authors issued several recommendations based on the outcome of the drill: decontamination should be conducted by non-ED staff, children's hospitals must be prepared to treat adult patients, and disaster drills should include the entire hospital, instead of focusing on the ED (Timm & Reeves, 2007). However, convincing staff and management of this approach could be challenging as many health care providers incorrectly believe that the majority of patients will arrive at the facility already decontaminated (Mitchell, Kernohan, & Higginson, 2012).

Drills

Organizations that practice disaster drills may be better prepared for disaster than those that lack this experience. In a study of ED nurses, half had participated in a drill within one year and 21.5% had never looked over their hospitals' disaster plan, while a small number did not know where to locate the plan. For nurses to feel more prepared, they need to be aware of their expected role during a disaster (Whetzel, Walker-Cillo, Chan, & Trivett, 2013). Lim, Lim, and Vasu (2013) identified the following factors to influence HCWs' overall feelings of preparedness: disaster-related knowledge, training, access to facility plans, support of family, and confidence in department and hospital leadership.

Goodhue, Burke, Chambers, Ferrer, and Upperman (2010) described a hospital-based disaster preparedness drill covering topics such as infectious disease and waste management. The drill consisted of 86 total participants, 51 of whom completed the evaluation (including 23 nurses). The researchers concluded that drills test the ability of nurses to follow disaster plans and disaster-related knowledge and skills. However, when hospitals conduct disaster drills, they are often unrealistic. Although the knowledge of and access to appropriate PPE has been shown to be a concern for nurses, some hospitals do not practice with PPE during drills (Goodhue et al.,

2010). Baumann (2014) found that nurses' overall sense of disaster preparedness was influenced by both their workplace and their personal and family preparedness.

Cartwright, Hall, and Lee (2017) conducted a literature review examining disaster preparedness in the event of an earthquake. Several major themes were revealed from their analysis of 152 articles. Often, adult and pediatric patients were treated in the same area, which became difficult during triage. Frequently, disaster planning policies were not developed at the local level, leading to a lack of preparedness. An emphasis was placed on the importance of planning to all other phases of disaster preparedness and response. The researchers also found a common deficit in the frequency of workplace drills and exercises involving the implementation of emergency plans (Cartwright, Hall, & Lee, 2017).

Dziuban, Peacock, and Frogel (2017) discussed the gaps in pediatric preparedness in the event of a public health emergency and emphasized the importance of including a pediatric component to disaster drills. This inclusion will not only allow a focus on the developmental needs of children in a disaster, but will also help establish and maintain relationships between facilities and pediatric medical professionals (Dziuban, Peacock, & Frogel, 2017).

In summary, the literature suggests that drills should test the ability of staff to follow institutional disaster plans, but they often do not include testing of the full plans. In addition, drills have been described as unrealistic. For example, in one study, staff did not implement the use of appropriate PPE. Also, many lack a pediatric component, which is essential to disaster preparedness.

Nursing Role in Planning

The role of nurses in planning for disasters could impact overall knowledge and self-efficacy, yet nurses are often not included in hospital or community disaster planning. Fendya

(2006) emphasized the role pediatric trauma nurses should have in disaster planning. Trauma nurses have the ability to work on both community and hospital plans. As part of community planning, they can coordinate with EMS to establish protocols in the event of pediatric casualties during a disaster. By including pediatric trauma nurses, it is more likely children's needs will be met during a disaster, and they can serve as a resource for other responders and providers in the community (Fendya, 2006).

Smith and Hewison (2012) conducted a literature review exploring nursing preparedness for a bioterrorism event and expanded on the importance of including nurses in planning by stating that hospitals have a responsibility to encourage nurses to participate and allow them to actively engage in the planning and preparedness process. Nurses also need to recognize their unique and valuable contributions and be willing to disperse knowledge to their departments (Smith & Hewison, 2012). Smith and Hewison (2012) also found that most nurses would respond to a bioterrorism event, but would be influenced by their personal knowledge and type of event. In addition, nurses have the responsibility to be aware of public health threats and need to understand the real risk of a bioterrorism event. Thus, nurses' role in planning may positively impact disaster preparedness.

Gaps in the Literature

Disaster nursing is a relatively new field of research; however new studies are continually emerging. As evidenced by the literature review, there are limited studies that focus specifically on ED nurses. In addition, several factors that may influence disaster preparedness have little evidence. For example, there were only two studies that addressed self-efficacy. Eleven of the 28 articles addressed pediatrics. However, there were no studies that addressed pediatric disaster preparedness, self-efficacy, and ED nurses. Two studies found a positive correlation between

knowledge and self-efficacy, but these were not assessed using validated tools. Very few of the nursing studies mentioned a theoretical foundation. Because the field is constantly developing, there has been little replication of studies to strengthen our understanding of pediatric disaster preparedness, ED nursing, and self-efficacy. Therefore, it is difficult to make conclusions with confidence. In addition, nine of the studies were conducted outside the US, so it is difficult to know how results from other countries would apply to American healthcare workers. Because only four of the studies exclusively examined ED nurses, it is also unknown what impact the hospital unit had on the findings and the generalizability of results. Thus, there are several significant gaps in the literature.

While the current study had some limitations, it added to the current body of knowledge regarding inpatient nurses and pediatric disaster preparedness. The study consisted of a convenience sample of inpatient nurses at one institution. Therefore, there is limited generalizability. However, for this institution, the study results could help guide new policies and training. In addition, it also provided direction for future research and could serve as a model for similar studies at other facilities.

How Research Addressed Gaps

This research was the first study to examine pediatric disaster preparedness and self-efficacy among nurses. First, the proposed study tested a fully-specified model that included personal, unit, and organizational factors related to disaster preparedness. Second, the study used a tool that is valid and reliable for data collection, which strengthened confidence in the findings. Using the Disaster Preparedness Evaluation Tool (DPET) allowed for the identification of gaps in knowledge and areas of focus for future education. If a positive correlation could be shown between knowledge and self-efficacy, and self-efficacy has been shown to improve outcomes

and increase nurses' willingness to report to work during a disaster, it would contribute to existing evidence of the importance of disaster education and training. Third, the study was grounded in the Theory of Self-Efficacy. Thus, the relationships examined were viewed within the lens of a nursing theory. Finally, the study included nurses from a Midwestern level 1 pediatric trauma center, allowing the opportunity to explore potential differences in knowledge, preparedness, and self-efficacy which may have implications for other pediatric hospitals in the US.

Conclusion

There are many factors related to nurses and pediatric disaster preparedness and self-efficacy. The literature review focused on the following factors: nursing role in planning, nursing role during disaster, staffing, education, willingness to respond, preparedness, and confidence and self-efficacy. The least amount of literature regarded self-efficacy and disasters. Because there is now a tool to assess disaster self-efficacy, the hope is that more research will be conducted in this area.

Chapter 3: Quantitative Methods

Introduction

The goals of the study were to describe disaster preparedness among registered nurses, compare disaster preparedness between nursing units, and examine the effects of individual, unit, and organizational factors on disaster preparedness. The chapter will review the theoretical framework guiding the study, including the perspective of the theory and the rationale for its use. The chapter also will discuss the research methodology. It will describe the study design, data source, sample, recruitment, instrument, and study measures to be used. The analysis plan and analytical issues will be discussed.

Theoretical Framework

Bandura's Theory of Self-Efficacy

Bandura first published the Theory of Self-Efficacy (then termed "Self-Efficacy Theory") in 1977. Self-efficacy is the belief that one has the ability to accomplish a given task. Efficacy expectations come from four main sources: performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal (Bandura, 1977). Performance accomplishments are based on one's successful completion of a desired task in the past. Repeated successes or failures can alter expectations. If one has high self-efficacy for given tasks, these levels tend to positively influence the ability to complete additional tasks. Vicarious experience can positively influence self-efficacy as one can observe others successfully completing a desired task, which increases one's own belief that he or she can also accomplish the task. Verbal persuasion involves persuading others that they have the ability to engage in an action that will result in the desired outcome. Emotional arousal addresses one's emotional state when attempting to achieve a task. High levels of stress and anxiety can decrease one's self-efficacy (Bandura, 1977).

Theory of Self-Efficacy and Theoretical Assumptions

There are several assumptions underlying the Theory of Self-Efficacy (Bandura, 1977). The first assumption is that people evaluate information regarding their own abilities and use this to make decisions about their behaviors. The second assumption of the Theory of Self-Efficacy is that people develop similar expectations from similar experiences. Thirdly, it is assumed that people process efficacy information in similar ways. Finally, there is the assumption that the influence of efficacy on action is similar among people (Bandura, 1977).

Theory of Self-Efficacy and Disaster Preparedness

Nursing research using self-efficacy focuses on behavior change. One main area of nursing research using self-efficacy is on exercise and motivating/influencing factors. Extensive research has been published in this area, but studies of self-efficacy have also grown to include topics such as chronic illness, symptom management, nursing education, health behaviors, cultural competence, patient self-management, and cancer care (Abbott, Schluck, Graven, & Martorella, 2018; Blake, Stanulewicz, & McGill, 2017; Chan et al., 2018; Choo & Kang, 2015; Klompstra, Jaarsma, & Strömberg, 2018; Smith & Liehr, 2014; Peterson & Bredow, 2013).

Performance Accomplishment

Among nurses in a pediatric hospital, performance accomplishment may be associated with disaster preparedness. Nurses with more years of disaster experience may be better prepared for a disaster, compared to nurses with less experience. Those with more experience working in a disaster have likely accomplished more disaster-specific tasks, such as alternative triage methods and resource limitations, than those with less experience, increasing the belief that they can accomplish these tasks effectively in the future, because they have successfully completed them in the past. Previous disaster experience was positively correlated with overall feelings of

preparedness (Arbon et al., 2013; Baack & Alfred, 2013). These characteristics may influence a nurse's overall perception of his or her disaster preparedness. Nurses with greater performance accomplishment may demonstrate a higher level of disaster preparedness than their less experienced colleagues. Thus, the hypothesis tested in this study was:

Hypothesis 1: Nurses with previous disaster experience will be more prepared for disasters than those without previous experience.

Emotional Arousal

Nurses working in a pediatric ED often deal with stressful and emotional situations. On a daily basis, they are faced with overcrowding, inadequate staffing and resources, and difficult patient situations (such as child abuse) (Abraham et al., 2018). These daily challenges will likely be compounded in a disaster. However, as ED staff are exposed to these stressors daily, they may be better able to cope emotionally during a disaster.

Hypothesis 2: Nurses working in the ED will be more prepared for disasters than non-ED nurses.

Vicarious Experience

Nurses in a pediatric hospital have different experiences with disaster training and drills. The assumption was that nurses with more experience have had more time and opportunities to participate in training and drills either through advanced education or experience working in a hospital. Jonson, Pettersson, Rybing, Nilsson, and Prytz (2017) found a statistically significant increase in the self-efficacy of head nurses in the ED after participating in a mass casualty simulation. Simulation was found to increase knowledge through vicarious experience (Thidemann & Söderhamn, 2013). Those with higher levels of education and previous disaster

training and drill participation should demonstrate higher levels of disaster preparedness compared with less educated colleagues. Thus, the hypothesis tested in this study was:

Hypothesis 3: Nurses with prior disaster education will be more prepared for disasters than those without prior education.

Verbal Persuasion

Nurse managers or supervisors should have the ability and responsibility to encourage staff through verbal persuasion. Verbal persuasion can be used to help encourage staff when learning a new skill (Manojlovich, 2005). Because they can help support others, they may also demonstrate a higher level of preparedness themselves. Nurse managers have the responsibility of verbally persuading their staff to carry out tasks, including disaster drills and education. Managers should be role models and also likely know their staff well. This knowledge may increase the effectiveness of verbal persuasion, as they know their staff's learning style and skills. Thus, the hypothesis tested in this study was:

Hypothesis 4: Nurse managers will be more prepared for disasters than non-nurse managers (staff nurses).

Conceptual Model

This study used a conceptual framework based on Bandura's Theory of Self-Efficacy to explain the relationship between performance accomplishment, emotional arousal, vicarious experience, and verbal persuasion and disaster preparedness (Figure 3).



Figure 3
Conceptual Model of Disaster Preparedness

Methods

Research Design

The research used a non-experimental, correlational design. In this type of research, variables are not manipulated, either because it is not possible or would be unethical. The purpose is to understand the relationship between the variables of interest in which the independent variables have already occurred (Polit & Beck, 2004). Although non-experimental studies are unable to demonstrate causation between variables (when compared to an experimental design), there are several benefits to conducting a study with this design (Polit &

Beck, 2004). Often, they can be the first step in the research process, where subsequent studies will be experimental to further investigate the phenomenon of interest. In addition, non-experimental designs provide the opportunity to collect large amounts of data (Polit & Beck, 2004). Thus, this study employed a non-experimental design to examine the relationship between nurse, unit, and organizational factors and disaster preparedness.

Setting

A convenience sample of nurses at a Midwestern level 1 pediatric trauma, 280 bed, inner-city hospital in a Midwestern city was used for this study. In 2017, there were a total of 1,388 nurses employed, with 889 practicing in inpatient units (H. Fields, personal communication, January 11, 2018).

Sample

This study used a convenience sample. Convenience sampling involves using study participants who are easily accessible to the researcher (Hulley et al., 2013; Polit & Beck, 2004). The population of interest was hospital-based nurses who care for pediatric patients. The sample was composed of hospital-based nurses at a single pediatric facility. A concern with this sample was that it may not be representative of the population of interest (Polit & Beck, 2004). However, the long-term goals of the proposed research include further data collection with a more representative sample, with the end result being an educational program to improve the care of pediatric disaster victims.

Inclusion criteria included active employment at the hospital and English language proficiency. The inclusion criteria were fluency in English and at least one year of employment as a nurse at the hospital of study. As the survey was administered in English, language proficiency was a requirement for participation. Exclusion criteria included length of

employment and non-RN status. The criterion of one year of nursing experience at the hospital of study eliminated some of the population from participating. However, after one year, nurses should have received disaster preparedness education and participated in training. This better represented education at the facility. New nurses may not have had the opportunity for this training and this could affect the overall results of the study as the quality of training could not be adequately assessed with this group.

A power analysis was conducted to determine the minimum sample size necessary to detect a difference in disaster preparedness due to personal, unit, and organizational factors, if they existed. Calculations were based on widely accepted conventions for statistical power (0.80), Type II error rate ($\beta=1-.80=0.20$), and significance level ($\alpha=0.05$) (Houle et al., 2005). Based on the literature's recommendation, a conservative effect size of 0.15 was used in calculating the sample size (University of Central Florida, 2016). A sample size calculator was used for multiple regression (Soper, 2020). Based on 14 regressors, it was determined that a sample size of 135 nurses would be required. In the final analysis, only four regressors were used (reasons for elimination are discussed in the results and data analysis), indicating that a sample size of 84 was sufficient (Soper, 2020). The hospital employs 1,388 nurses, with 889 practicing in inpatient units (H. Fields, personal communication, January 11, 2018). Without access to individual employee information, it was unknown how many of the 889 inpatient nurses met the inclusion criterion of one year of employment. From personal communication with unit educators and management, many of the units were hiring new staff, so it is likely that a number of the 889 nurses were ineligible to participate. The hospital is an academic institution and supports nurses pursuing graduate degree research.

Recruitment

Recruitment Approach

A systematic approach to recruitment was used for this study. Although there are different methods available for recruitment in survey research, the Dillman technique has been used in social science research for decades and was used for the study (Dillman et al., 2014). Dillman discussed social exchange in the context of survey research, which states that participants are more likely to respond to survey research if they believe that benefits will eventually outweigh the cost of responding (Dillman et al., 2014). He also indicated that people will typically decide within several days whether they intend to respond to a survey request, while many decide immediately upon receiving the information (Dillman et al., 2014). Several strategies mentioned by Dillman to increase response rates include how results will be used to affect change and including sponsorship from an organization (Dillman et al., 2014). In subsequent requests for participation, response rates can be increased by demonstrating that others from the population of interest have participated (Dillman et al., 2014).

Dillman recommends sending an initial survey request, followed by two or three additional contacts (Boutis, Fischer, Freedman, & Thomas, 2014; King, Pealer, & Bernard, 2001). Subsequent requests for participation should contain a different focus from previous contacts. The initial invitation should focus on the goal of the research, why the specific sample is targeted, assure confidentiality of results, and include the name and contact information of the researcher (Dillman et al., 2014). While the timing of follow-up emails varies depending on the study, one example suggests five email contacts with participants at pre-determined dates (Dillman et al., 2014).

Recruitment Processes

Initial data collection occurred at the researcher's hospital of employment. The survey was sent to participants' work emails. As most nurses do not work Monday through Friday and may only check emails at work, the researcher gave participants slightly more time to complete the survey than the three days suggested by Dillman (Dillman et al., 2014).

Due to its adaptability and widespread successful use in the social sciences, the Dillman technique was used for the study (Dillman et al., 2014). The first step for recruitment in the research study was to send an email to the unit educators several days prior to sending the survey, introducing the study and alerting them of the survey to follow, along with requesting distribution of the email to staff. Included with the survey was a letter from the Chief Nursing Officer (CNO) as additional support for the study.

The next step was to send another email with the link for the survey to the educator. Participants then had one week to respond. After a week had passed, the researcher contacted the nursing educators for follow-up and a new email and another link to the survey was sent. An adequate number of participants had not been achieved based on the power analysis, and therefore the researcher contacted each educator about addressing staff during daily huddles. The researcher also requested to speak more in depth about the survey and research topic at staff meetings. However, because staff meetings do not occur frequently, the researcher attended a huddle on many units, and then staff meetings as available. In addition, flyers were placed in staff lounges advertising the survey and how to access it. After several months of attending staff meetings and huddles, one last email was sent out to the educators. Recruitment using the Dillman technique is summarized in Table A1 in Appendix A.

Challenges and Opportunities of Recruitment Strategy

By recruiting participants from the researcher's place of employment, there could have been a higher response rate. However, there were several concerns with this approach. Familiarity with the researcher could have led to selection bias, as participants may have falsely elevated their perceived knowledge and self-efficacy due to potentially perceived expectations of the researcher, leading to threats to validity including reactivity to the experimental situation and experimenter expectancies (Shadish et al., 2002). Selection bias can result from non-random sampling, as it may be difficult to determine whether differences found in the study were pre-existing (Brink & Wood, 1998; Polit & Beck, 2004). In the study, results could have been influenced by nurses' prior place of employment and any training or education they have received outside of the workplace. Some of these issues were addressed in demographic questions.

There are numerous threats to validity in a non-experimental design. Inadequate precision occurs when extraneous variables are influencing the dependent variables, outside of the independent variables that are being explored (Polit & Beck, 2004). While data from past research was used to determine the independent variables, there was always the possibility of extraneous variables. Few researchers have applied the DPET, and those few studies likely have not captured all the major independent variables. In addition, there was the possibility of history acting as a threat to internal validity. This occurs when events outside of the study may impact the dependent variable (Polit & Beck, 2004). In the study, there could have been a disaster occurring just prior to data collection or during data collection. As there is no way to anticipate a specific disaster, if this occurs, it would be addressed in the discussion of the study results. A hospital-wide disaster drill was conducted, but this occurred several months after data collection

had stopped. In addition, the Covid-19 pandemic also began after the cessation of data collection. While the generalizability of the study was limited due to the sample from one pediatric institution, the impact of the findings are significant for this population (Polit & Beck, 2004). In addition, findings will be used to direct future training in the facility and emphasizing this may have helped to increase response rate.

Instrument

Few tools exist to evaluate disaster preparedness among nurses and other health professionals. The Disaster Preparedness Evaluation Tool (DPET) has been used in several studies around the world and is the most valid and appropriate tool available for the proposed research study.

Description of the Instrument

The DPET was originally developed by nurse practitioners (NPs) with disaster knowledge. The instrument consists of 47 items grouped in seven categories: disaster knowledge, disaster skills, family preparedness for a disaster, knowledge specific to response, patient management during response, recovery knowledge, and recovery management (Tichy, Bond, Beckstrand, & Heise, 2009). The questions consist of a Likert-type scale, with participants ranking answers from 1 (strongly disagree) to 6 (strongly agree) (Tichy et al., 2009). The seven categories were further condensed into three: disaster preparedness (disaster knowledge, disaster skills, and family preparedness for a disaster), response abilities (knowledge specific to response and patient management during response), and recovery preparedness (recovery knowledge and recovery management) (Tichy et al., 2009).

Psychometric Testing

The instrument developers addressed content validity using several expert panels of NPs from different geographic locations for feedback regarding the content and design during instrument development. An expert panel is a common method used to support the content validity of an instrument (Brink & Wood, 1998; Dillman, Smyth, & Christian, 2014; Langbecker et al., 2017; Polit & Beck, 2004; Streiner, Norman, & Cairney, 2015). Content validity addresses how well an instrument represents the construct of interest (Brink & Wood, 1998; DeVellis, 2017; Hulley, Cummings, Browner, Grady, & Newman, 2013; Polit & Beck, 2004; Streiner et al., 2015).

The instrument developers also conducted additional psychometric tests to evaluate the reliability of the instrument and found that the Cronbach's α for each group was .93, .93, and .91, respectively (Tichy et al., 2009), addressing the internal consistency of the tool. Internal consistency demonstrates the extent to which items on a tool measure the same trait (Polit & Beck, 2004), and correlation between items in the questionnaire (Langbecker et al., 2017). Cronbach's α is the most commonly used statistic to address internal consistency, and values range from 0.00 to 1.00, where a higher number indicates greater internal consistency (Polit & Beck, 2004). When referencing the DPET, high internal consistency would establish that items in each of the three subgroups (disaster preparedness, response abilities, and recovery preparedness) in the tool are addressing disaster preparedness.

Review of the Literature

Several studies have used the DPET and reported psychometric testing results. Al Khalaileh, Bond, Beckstrand, and Al-Talafha (2010) conducted a study of Jordanian nurses using an Arabic translation and found that preparedness was not influenced by age, sex, or educational

level, but there was a significant difference in preparedness depending on the type of hospital (university or government) and years of experience. Chen, Chou, Liao, Ho, and Chung (2014) established a Chinese version of the DPET and studied a group of Taiwanese nurses. The focus of their study was to determine the validity of their translation. However, the authors also found that disaster preparedness was not influenced by gender, age, work experience, or education (Chen et al., 2014). Al Thobaity, Plummer, Innes, and Copnell (2015) used the English language version of the DPET to study a group of Saudi Arabian nurses and found that overall, nurses demonstrated a “moderate” level of disaster preparedness, but a willingness to learn and obtain additional education. The majority of nurses reported receiving education through drills, followed by continuing education classes (Al Thobaity et al., 2015).

Challenges

While the DPET was originally developed for NPs, in subsequent studies, the DPET has only been used to assess the disaster preparedness of nurses. However, the scale does not specify exclusive NP tasks or knowledge, and therefore the application to nurses is appropriate. Studies included a variety of nursing units and specialties, while none focused exclusively on pediatrics. The current study was the first to emphasize pediatrics. In addition, it was the first American study using the DPET for nurses. The DPET has not been used to evaluate the pediatric disaster preparedness of nurses or NPs. The DPET has been validated, but has not been used extensively in nursing studies. The instrument has been translated into several languages, but was only administered in the US for the initial study. In addition, it is unknown in most of the studies what hospital departments were represented by participants. There was the possibility that participants may elevate their perceived knowledge or level of preparedness. However, Chen et al. (2014)

conducted extensive testing supporting the validity of the DPET. In addition, no other tools exist to measure the disaster preparedness of nurses.

Measures

Table 2 indicates the variables proposed for this study.

Table 2
Study Measures

Variables	Definition
Dependent Variables	
Disaster Preparedness	Mean score on disaster preparedness
Response Abilities	Mean score on response abilities
Recovery Preparedness	Mean score on disaster recovery
Overall Disaster Preparedness	Mean score on overall disaster preparedness
Independent Variables	
Disaster Experience	Whether or not RN has prior disaster experience
Unit Type	Whether RN works in ED or non-ED unit
Prior Disaster Education	Whether or not the RN had prior disaster education
Nurse Manager	Whether or not the RN is a nurse manager
Covariates	
Age	Age of RN in years
Race	Asian, Black or African American, White, and prefer not to say/no response
Ethnicity	Hispanic or not Hispanic, prefer not to say/did not answer
Education Level	ASN/Diploma, BSN, MSN or higher, and other
Nursing Experience	Years of nursing experience

Dependent Variable

The dependent variable was the perceived level of disaster preparedness of nurses in the study. Four measures of disaster preparedness were created using the DPET: disaster preparedness, response abilities, recovery preparedness, and overall disaster preparedness. Table A2 contains the tool. Categorical measures were created using the approach suggested by Al Khalaileh, Bond, and Alasad (2012), in which disaster preparedness was a composite score of 24 questions from the DPET. One question addressing disaster literature was eliminated, as numerous questions covered this topic. These questions included the following (Table 3), and focused on disaster knowledge, disaster skills, and family preparedness.

Response abilities were operationalized as the mean score of 16 questions from the DPET that include knowledge specific to response and patient management during response. Recovery preparedness was measured as the mean score of 5 questions that focus on recovery knowledge and recovery management. One question was eliminated as it focused on providing independent patient care, which is not within the nursing scope of practice. The final overall disaster preparedness measure was created by taking the overall mean from the 45 items.

Independent Variables

Guided by the Theory of Self-Efficacy, this study examined four independent variables. The first was performance accomplishment, which was measured by previous disaster experience. This variable was operationalized by whether or not the nurse has past experience working in a disaster.

Emotional arousal was measured by unit type, which was operationalized as whether the nurse works in the ED or other non-ED unit. Vicarious experience was addressed by prior disaster training. This variable was operationalized as whether or not the nurse had received any

Table 3
Disaster Preparedness Evaluation Tool

Disaster Preparedness

1. I would be interested in educational classes on disaster preparedness that relate specifically to my community situation.
2. I know the limits of my knowledge, skills, and authority to act in disaster situations.
3. I am aware of potential vulnerabilities in my community (earthquake, flood, terror, etc).
4. I find that the research literature on disaster preparedness is understandable.
5. I have a list of contacts in the medical or health community in which I practice. I know referral contacts in case of a disaster situation (health department, etc).
6. I read journal articles related to disaster preparedness.
7. I know where to find relevant research or information related to disaster preparedness and management to fill in gaps in my knowledge.
8. I find that the research literature on disaster preparedness and management is easily accessible.
9. In case of a disaster situation, I think there is sufficient support from local officials on the county or state level.
10. I am familiar with the local emergency response system for disasters.
11. Finding relevant information about disaster preparedness related to my community needs is an obstacle to my level of preparedness.
12. I know whom to contact (chain of command) in disaster situations in my community.
13. I am aware of classes about disaster preparedness and management that are offered in my workplace, university, or community.
14. I participate in one of the following educational activities on a regular basis: continuing education classes, seminars, or conferences dealing with disaster preparedness.
15. I have participated in emergency planning for disaster situations in my community.
16. I participate/have participated in creating new guidelines or emergency plans or in lobbying for improvements on the local or national level.
17. In case of a bioterrorism/biological attack, I know how to use personal protective equipment.
18. I am familiar with accepted triage principles used in disaster situations.
19. In a case of bioterrorism/biological attack, I know how to perform isolation procedures so that I minimize risks for community exposure.
20. I participate in disaster drills or exercises at my workplace (clinic, hospital, etc) on a regular basis.
21. In case of a bioterrorism/biological attack, I know how to execute decontamination procedures.
22. I consider myself prepared for the management of disasters.
23. I would be considered a leadership figure in my community in a disaster situation.
24. I have personal/family emergency plans in place for disaster situations.
25. I have an agreement with loved ones and family members on how to execute our personal/family emergency plans.

Response Abilities

1. I am familiar with psychological interventions, behavioral therapy, cognitive strategies, support groups, and incident debriefing for patients who experience emotional or physical trauma.
2. I am able to describe my role in the response phase of a disaster in the context of my workplace, the general public, media, and personal contacts.
3. Some research has shown that nurses feel constrained by medical malpractice concerns of license restrictions in terms of responding to disasters. This constraint applies to me too.
4. I am familiar with the organizational logistics and roles among local, state, and federal agencies in disaster response situations.
5. I would feel reasonably confident providing patient education on stress and abnormal functioning related to trauma.
6. I can manage common symptoms and reactions of disaster survivors that are of an affective, behavioral, cognitive, or physical nature.
7. I feel reasonably confident I can treat patients independently without supervision of a physician in a disaster situation.
8. I can identify possible indicators of mass exposure evidenced by a clustering of patients with similar symptoms.
9. I would feel confident working as a triage nurse and setting up temporary clinics in disaster situations.
10. As a nurse, I would feel confident as a manager or coordinator of a shelter.
11. As a nurse, I would feel confident in my abilities as a direct care provider and first responder in disaster situations.
12. I would feel reasonably confident implementing emergency plans, evacuation procedures, and similar functions.
13. As a nurse, I would feel reasonably confident in my abilities to be a member of a decontamination team.
14. I feel reasonably confident discerning deviations in health assessments indicating potential exposure to biological agents.
15. I am familiar with the main groups (A, B, C) of biological weapons (anthrax, plague, botulism, smallpox, etc), their signs and symptoms, and effective treatment.
16. In a bioterrorism/biological attack, I would know how to perform a focused health history and assessment specific to bioagents that are used.

Recovery Preparedness

1. I am familiar with what the scope of my nurse role would be in a post-disaster situation.
2. I am able to discern signs and symptoms of acute stress disorder and post-traumatic stress disorder (PTSD).
3. I am comfortable providing education on coping skills and training for patients who experience traumatic situations.
4. I am comfortable managing (treating, evaluating) emotional outcomes for acute stress disorder or PTSD.
5. I am familiar with how to perform focused health assessment for PTSD.
6. I participate in peer evaluation of skills in disaster preparedness and response.

prior disaster education. Lastly, verbal persuasion was assessed by nursing role and was operationalized as whether the participant was a manager or staff nurse.

Control Variables

A group of control variables were used in this analysis. Personal characteristics included age, race, and ethnicity. Age was a continuous variable. Race was categorized as: Asian, Black or African American, White, and prefer not to say/did not answer. Ethnicity was whether the nurse was Hispanic or not or preferred not to say/did not answer. Highest level of education obtained was defined as an Associate's Degree/Diploma, BSN, MSN or higher, or other. Nursing experience was operationalized as a continuous variable, where participants indicated how many years they had been in their current unit.

Data Analysis

Analysis Plan Aim 1

Aim 1 was to describe disaster preparedness among registered nursing and nursing units. Descriptive statistics were calculated for all variables in the model. Measures of central tendency (including the mean) and variability (including range and standard deviation), were used for continuous variables such as age, years in current unit, and years of nursing experience, while frequencies and percentages were calculated for discrete variables (Polit & Beck, 2004).

Analysis Plan Aim 2

Aim 2 was to compare disaster preparedness between nursing units. T-tests and chi-square were used to compare the disaster preparedness between nurses in the ED versus non-ED nurses. The mean disaster preparedness scores for each of the three main categories (disaster preparedness, response abilities, and disaster recovery preparedness) were used for analysis. To conduct this analysis, chi-square was used for categorical variables, and t-tests for continuous

variables (disaster preparedness scores). This analysis was appropriate because t-tests are used to compare means when there are two groups (Polit & Beck, 2004). The mean disaster preparedness scores were calculated for both groups, and a t-test was performed on this data. Chi-square was used to analyze differences between categorical variables for each unit. This test is appropriate for nominal variables (Kellar & Kelvin, 2013).

Analysis Plan Aim 3

Aim 3 was to examine the association between individual, unit, and organizational characteristics associated with disaster preparedness among nurses in the pediatric hospital. The data analysis plan for Aim 3 included an examination of the association between disaster experience, unit type, prior disaster education, nurse manager status, and nurse disaster preparedness, while controlling for nurse characteristics. One of the goals of the research study was to determine what factors influence or predict disaster preparedness. This study used ordinary least squares (OLS) regression because the proposed dependent variables were continuous. Individual regressions were conducted for the four dependent variables. OLS allows for the study of the influence of multiple independent variables on the dependent variable (Kellar & Kelvin, 2013). Multiple regression allows for the prediction of disaster preparedness based on the given value(s) of an independent variable or variables (Kellar & Kelvin, 2013). Multiple regression also allows for the control of variables, which increases the ability to explain the variance in the dependent variable and more adequately addresses the concept of interest (disaster preparedness) (Keith, 2015).

Assumptions

For Aim 3, the six assumptions of OLS regression were addressed. First, was the representativeness of the sample (Kellar & Kelvin, 2013). One weakness of convenience

sampling is that samples often are not representative of the population (Polit & Beck, 2004). Other than calculating the percentage of nurses participating from each unit, there was demographic information to compare for each unit with those who actually participated.

Second, was the normality of the distribution of errors, as estimated by the residuals (Orme & Combs-Orme, 2009). In previous studies, overall preparedness appeared to be normally distributed, so it was likely that these values would be normally distributed in the sample. However, if there were major outliers, further statistical tests would have been run before conducting the regression to determine if data would potentially need to be eliminated or other actions taken (Kellar & Kelvin, 2013). This was evaluated by creating a histogram of the residuals, which is one way to visualize the distribution. If the residuals had appeared skewed, a linear transformation would have been conducted, in which the logarithmic value would have been used. This would have allowed for a more normal distribution (Kellar & Kelvin, 2013).

Third, was the presence of homoscedasticity (Kellar & Kelvin, 2013). Residual analysis allowed the researcher to determine the presence of homoscedasticity, which implied that the variance of errors was similar for each independent variable around the regression line (Bannon, 2013; Keith, 2015). If heteroscedasticity was present, weighted least squares linear regression would have been performed (Kellar and Kelvin, 2013). Another possibility was to transform the variable, using logarithmic, square root, or inverse transformation (Bannon, 2013). This was evaluated by scatter plots, which are a useful way to examine this assumption. If heteroscedasticity had been present, weighted least squares linear regression would have been performed (Kellar and Kelvin, 2013).

Fourth, was the presence of a linear relationship between the independent variables and the dependent variable (Kellar & Kelvin, 2013). It was expected that there was a linear

relationship (for example, the more ED experience, the higher the level of preparedness).

However, if some of the independent variables had not had a linear relationship, they may have been removed from analysis and the regression would have been rerun. If it had been found that those with one year of experience and those with more than 15 years had low levels of preparedness, while those with experience in between had high levels of preparedness, then experience would not have been a good predictor of level of preparedness. This could have been evaluated by another technique to address a non-linear relationship, which would be to add a curve component to the regression equation, which may have improved the ability to explain variance. This linear relationship would have been addressed before further data analysis was conducted (Keith, 2015).

The fifth assumption of linear regression was that each person was selected independently from the population of interest. Each participant's answers should have been independent from, and not influenced by, the response of others (Keith, 2015). This was evaluated by the regression equation; the error for each participant should have been independent from the errors of other participants (Keith, 2015).

The last assumption is the absence of multicollinearity. This would mean that some of the independent variables were so closely related that they could not be distinguished statistically (Kellar & Kelvin, 2013; Bannon, 2013). To assess multicollinearity, the variation inflation factor (VIF) was used. One common value that is used is 10.0, meaning that if the VIF was greater than 10, the independent variables are too closely related (Bannon, 2013).

Goodness-of-Fit

For Aim 3, a goodness of fit estimate was evaluated to assess the regression model. The R^2 provided a goodness of fit estimate. This statistic takes into account all the independent

variables as a whole and estimates the variance in the dependent variable that is explained by the independent variables (Keith, 2015; Kellar & Kelvin, 2013; Polit & Beck, 2004) or how well the model matches the data obtained in the study (Bannon, 2013; Kääriäinen, et al., 2011; Polit & Beck, 2004). The values range from 0 to 1, with 0 indicating the model does not explain any of the variability in the data. The closer the value is to 1, the better the fit of the model (Keith, 2015; Kellar & Kelvin, 2013). R^2 is interpreted as a percent, with a value of 0.15 indicating that the model accounts for 15% of the variance in the data. The adjusted R^2 was used, as it took into account the sample size and number of independent variables (Kellar & Kelvin, 2013).

Analytical Issues

There were three main analytical issues for this study. First, there was a potential for selection bias. Because the study consisted of convenience sampling, selection bias was a concern. The participants may have differed in ways that influenced their responses, which were not evaluated in the study (Polit & Beck, 2004). Based on findings in previous studies, variables such as previous disaster experience and education were added to the demographic questionnaire to be included in the study. While there was no guarantee that these variables would explain the potential variation between groups, these additional variables were included because they were found to be significant in other studies examining disaster preparedness.

Second, there was a potential for response bias, meaning that participants may have altered their responses, sometimes because of what they believe the researcher wants to hear or because they want to look good in front of their peers (Polit & Beck, 2004). Each participant's answers should be independent from, and not influenced by, the response of others (Keith, 2015). This was evaluated by the regression equation; the error for each participant should have been independent from the errors of other participants (Keith, 2015). While there is no simple way to

address this, in the information about the study presented to participants, there was an emphasis that results were strictly confidential and were used to help improve preparedness in the hospital. Also, because the survey was in an email, participants could access it from home, giving them more privacy if they were concerned that coworkers might look at their responses or discuss questions as they completed the survey.

Finally, there was a potential for omitted variable bias, which means that some variables that may have influenced results are left out of the model, either because they were unknown or because they may have been difficult to measure (Economic Theory Blog, 2018). Two conditions must occur to have an omitted variable bias. First, it must be correlated with the dependent variable (disaster preparedness score) and the omitted variable must be correlated with one or more independent variables (Economic Theory Blog, 2018). This issue can be difficult to address, as some influential variables may simply be unknown. To ensure that the model for this study is fully specified, a thorough review of the literature was conducted to identify potentially influential variables. Several others were added that were not frequently addressed in studies, so this study may have included a more fully specified model of influential variables than previously studied.

Summary

This study presented a unique opportunity to explore a topic that has not been researched. The Theory of Self-Efficacy has not been applied to the disaster preparedness of hospital-based nurses and the DPET has not been used in pediatrics. In addition, many hospital-based disaster preparedness studies focus on the ED, while eliminating other units from participating. The results of this study could be used to improve education and preparedness of the nursing staff at

the hospital of study. If future interventions are found to be successful and increase preparedness, it is possible they may be used at other institutions.

Chapter 4: Results

Introduction

The purpose of the study was to assess the disaster preparedness of nurses working on inpatient units in an urban level 1 pediatric trauma center. Disaster preparedness was measured using the Disaster Preparedness Evaluation Tool (DPET), which was administered via an online survey where all eligible nurses were invited to participate. One hundred and fifty-five inpatient nurses responded. The final analyses consisted of 138 nurses and the regression analysis included 136 nurses. The DPET addresses disaster preparedness, response abilities, recovery preparedness, and overall preparedness. The study had three aims, which will be addressed through tables, figures, and narratives. All of the surveys were not included in the final analysis and reasons for their elimination will be discussed. Tables show the statistics for the dependent and independent variables and covariates.

Aims

Aim 1

There were three aims for the study. Aim 1 was to describe disaster preparedness among registered nurses and nursing units. Descriptive statistics and measures of central tendency and variability were calculated for all variables in the study.

Aim 2

Aim 2 was to compare disaster preparedness between nursing units and to analyze differences between categorical variables for each unit. The participants were separated into two groups: ED and non-ED. The ED group contained 36 nurses, while the non-ED group consisted of 102 nurses. T-tests, chi-square analyses, and odds ratios were used to compare participants' mean scores in disaster preparedness, response abilities, recovery preparedness, and overall

preparedness. The hypothesis for Aim 2 was that ED nurses would have higher mean scores on the dependent variables compared to the non-ED nurses, indicating a higher level of preparedness.

Aim 3

Aim 3 was to examine the association between individual, unit, and organizational characteristics associated with disaster preparedness among nurses in the pediatric hospital. There were four hypotheses under this aim.

Hypothesis 1

Hypothesis 1 was that nurses with previous disaster experience would be more prepared for disasters than those without prior experience. This hypothesis was addressed with the question: “Over your nursing career, have you ever participated in a real disaster situation?”

Hypothesis 2

Hypothesis 2 was that nurses working in the ED would be more prepared for disasters than those nurses not working in the ED.

Hypothesis 3

Hypothesis 3 was that nurses with prior disaster education would be more prepared for disasters than those without training. The question used to address this was “I was educated about disasters in an undergraduate program.” While all participants would not have been eligible to select this answer, the question included the largest potential number of participants and was felt to be the best way to address training.

Hypothesis 4

Hypothesis 4 was that nurse managers would be more prepared for disasters than non-nurse managers (staff nurses). Hypothesis 4 was unable to be tested due to the small proportion of nurse managers who participated in the study.

Missing Data

The aims and hypotheses were addressed through administration of the DPET to inpatient nurses. The DPET was sent out through an email containing the link for the survey. One hundred-sixty total responses were recorded. There were some technical difficulties when the survey was first activated, and two of those responses were from technology support, and were eliminated. One of the first questions asked how long the nurses had been employed at the facility. This was a fill-in response and it was set to end the survey if the participant had not been employed for at least one year. However, this was coded incorrectly and all answers that were entered triggered the survey to end. This issue was quickly addressed, and an email was sent out notifying the nurse educators of the update.

Three of the respondents worked in non-patient care areas. While they were nurses who met the inclusion criteria, it is unlikely that they would have received training or would be involved in an initial disaster response. Inpatient unit educators were the only ones contacted in the study. However, other staff heard about the survey and completed it, although they were not the target sample. Therefore, because the study was interested in inpatient units, these three participants were eliminated from the analysis.

Participants were given the option to end the survey at any time and the only questions that required an answer were those addressing the inclusion criteria. Fifteen participants answered the majority of survey questions, but did not answer all of the questions for each of the

dependent variables. Because some of the questions were skipped, the means for each dependent variable could not be calculated for these nurses (means for each participant would not reflect the same questions). Therefore, these participants were eliminated from the final analysis. Of the 140 remaining participants, one did not answer the job description question, and was removed as job description was one of the independent variables used in the regression analysis. One more participant was eliminated as he or she did not answer in which unit he or she was employed. As unit was also an independent variable used in the regression analysis, this participant was also eliminated, leaving 138 participants for final analysis.

The covariate of highest level of education was categorized as ASN/Diploma, BSN, MSN or greater, or other. However, two of the 138 remaining participants answered “other” on the education question and were not included in the regression, leaving a total of 136 participants in the regression analysis. The power calculation indicated that 135 participants were required. Therefore, even though some cases were eliminated due to nurses not completing all the questions, 136 surveys were included in the regression, which was above the required number.

Aim 1

Aim 1 described disaster preparedness among registered nurses and nursing units. Descriptive statistics were calculated for all variables. Measures of central tendency and variability were determined for continuous variables and frequencies and percentages were calculated for discrete variables. The study included four dependent variables, four independent variables, and five covariates. (Specific information on the survey items and their values are listed in Appendix B- Tables B1, B2, and B3). The breakdown of the survey questions into the dependent variables was established by the authors of the DPET.

Dependent Variables

The dependent variables in the study were disaster preparedness, response abilities, recovery preparedness, and overall preparedness. Disaster preparedness was measured by calculating the means for each participant on questions regarding disaster knowledge, disaster skills, and family preparedness. The mean score for disaster preparedness was 3.16, with a range of 1.71-4.75. Response abilities including questions addressing knowledge specific to response and patient management during the response phase of a disaster. The mean score for response abilities was 3.14, with a range of 1.20-5.00. Recovery preparedness questions focused on recovery knowledge and recovery management. The mean score for recovery preparedness was 3.01, with a range of 1.00-5.00. Overall preparedness is a mean overall score for each participant, calculated from the means on the first three dependent variables. The mean for overall preparedness was 3.14, with a range of 1.52-4.86. Table 4 displays the minimum, maximum, mean, and standard deviations for these variables. Table 5 shows the correlations between the dependent variables. While all of the correlations were statistically significant, this was expected as they were measured by one scale for disaster preparedness. However, this was taken into account during data analysis.

Table 4
Mean Scores of Dependent Variables

Dependent Variable	Mean	Standard Deviation	Minimum	Maximum
Disaster Preparedness	3.16	.60728	1.17	4.75
Response Abilities	3.14	.76620	1.20	5.00
Recovery Preparedness	3.01	.91920	1.00	5.00
Overall Disaster Preparedness	3.14	.63123	1.52	4.86

Table 5
Correlations Between Dependent Variables

Variable	1	2	3	4
1. Disaster Preparedness	-	.711*	.607*	.919*
2. Response Abilities	.711*	-	.823*	.923*
3. Recovery Preparedness	.607*	.823*	-	.824*
4. Overall Preparedness	.919*	.923*	.824*	-

* $p < .05$

Independent Variables

There were four independent variables examined in the study: participation in a real disaster, unit type (ED or non-ED), previous disaster education, and position (nurse manager or staff nurse). Table 6 depicts the responses for the independent variables. Ten (7.24%) participants reported participating in an actual disaster at some point in their nursing careers. One hundred twenty-eight (92.75%) did not. Thirty-six participants (26.09%) worked in the ED, while 102 (73.91%) did not work in the ED. Eighty-six (62.32%) participants reported that they had received education about disasters in an undergraduate nursing program, while 52 (37.68%) did not. One hundred thirty-two participants (95.65%) were staff nurses, while the remaining six (4.35%) were nurse managers.

Covariates

Five covariates were examined in the study: age, race, ethnicity, highest level of education, and nursing experience. Table 7 depicts the statistics for the covariates. The age of the 138 participants ranged from 23-63 years, with a mean of 34.15 years. One participant (0.72%) identified as Asian, 1 (0.72%) as Black or African American, and 133 (96.38%) as White, while

Table 6
Independent Variables

Independent Variable	Frequency	Percentage
Participation in Real Disaster	10	7.24
Unit Type- ED	36	26.09
Disaster Education	86	62.32
Staff Nurse	132	95.65

one (0.72%) preferred not to say and two (1.45%) did not answer the question. One participant (0.72%) identified as Hispanic or Latino and 130 (94.20%) as not Hispanic or Latino. Two (1.45%) preferred not to say and 5 (3.62%) did not answer the question. Twelve participants (8.70%) had an associate's degree or diploma, 111 (80.43%) had a BSN, 13 (9.42%) had an MSN or higher, while 2 (1.45%) had an "other" degree. Years of nursing experienced ranged from 1-41, with a mean of 9.34 years.

Aim 2

Aim 2 was to compare disaster preparedness between nursing units, and to analyze differences between categorical variables for each unit. T-tests and chi-square were used to compare ED and non-ED nurses. Initially, participants were going to be divided into more groups. However, given the distribution of units of the participants, nurses were separated into two groups: ED and non-ED, and therefore t-tests were run instead of ANOVA. The mean scores for disaster preparedness, response abilities, recovery preparedness, and overall preparedness were compared between ED and non-ED nurses. Table 8 depicts the mean scores for the dependent variables for ED and non-ED nurses. The mean scores for ED nurses were 3.38 for disaster preparedness, 3.39 for response abilities, 3.27 for recovery preparedness, and

Table 7
Covariates

Covariates	Mean	Standard Deviation	Maximum	Minimum
Age	34.15	9.582	63	23
Years as RN	9.34	8.436	41	1
	Frequency	Percentage		
Race				
Asian	1	.72		
Black/African American	1	.72		
White	133	96.38		
Prefer not to say/no Response	3	2.17		
Ethnicity				
Hispanic/Latino	1	.72		
Not Hispanic or Latino	130	94.20		
Prefer not to say/no response	7	5.07		
Education				
Associate's/Diploma	12	8.70		
BSN	111	80.43		
MSN or higher	13	9.42		
Other	2	1.45		

3.37 for overall preparedness. The mean scores for non-ED nurses were 3.09 for disaster preparedness, 3.05 for response abilities, 2.91 for recovery preparedness, and 3.06 for overall preparedness. All of these demonstrated statistically significant differences between ED and non-ED nurses, with *p*-values of .015, .020, .043, and .015, respectively. For disaster preparedness,

response abilities, recovery preparedness, and overall preparedness, ED nurses demonstrated statistically significant higher levels of preparedness compared to non-ED nurses.

Table 8

Mean Scores of Dependent Variables for ED and Non-ED Nurses

Variable	N	Mean	Mean Difference	Standard Deviation
Disaster Preparedness				
ED	36	3.38		.59
Non-ED	102	3.09		.60
			.29*	
Response Abilities				
ED	36	3.39		.72
Non-ED	102	3.05		.77
			.34*	
Recovery Preparedness				
ED	36	3.27		.83
Non-ED	102	2.91		.94
			.36*	
Overall Preparedness				
ED	36	3.37		.60
Non-ED	102	3.06		.62
			.31*	

Note. Emergency Department is abbreviated as ED.

* $p < 0.05$

Levene's test for each of these variables is not statistically significant, as shown in Table 9, making it likely that any variation found is the result of equal variance in the population. The output from t-tests included in SPSS demonstrated significance levels for two different scenarios: equal variances assumed and equal variances not assumed. Levene's test allows for analysis of the homogeneity of variance. Because the p-values for each of the dependent variables are greater than .05, the variances are not significantly different, and therefore there is homogeneity

of variance, which indicates that the significance values for the “equal variances assumed” should be used (Kellar & Kelvin, 2013).

Table 9
Test for Equality of Variances for Dependent Variables

Variable	Levene's Test for Equality of Variances	
	F	Sig.
Disaster Preparedness	0.003	0.958
Response Abilities	0.054	0.816
Recovery Preparedness	1.124	0.291
Overall Preparedness	0.001	0.969

Table 10 contains chi-square, Fisher's Exact Test, and odds ratios for the categorical variables. Chi-square was used to compare the categorical variables between ED and non-ED nurses. Fisher's Exact Test can be used as an alternative to chi-square, and is more precise when expected cell counts are very small (less than 5) (Kellar & Kelvin, 2013). Odds ratios were calculated to demonstrate the strength of the relationship of the categorical variables between ED and non-ED nurses. Of the 36 ED participants, four (11.11%) identified as male, 23 (63.89%) as female, and nine (25%) preferred not to answer. Of the 102 non-ED participants, four (3.92%) identified as male, 80 (78.43%) as female, and 18 (17.65%) preferred not to answer. Because of the small sample and cells containing less than five participants, Fischer's Exact Test was used instead of Pearson Chi-Square. The *p*-value for Fischer's test was 0.133, demonstrating that there was not a significant difference in gender distribution between ED and non-ED nurses.

Table 10

Test of Differences Between ED and Non-ED Nurses on Independent Variables, Covariates, and Additional Categorical Variables

Variable	Pearson Chi-Square Value	Fisher's Exact Test	Odd's Ratio ED vs non-ED = ED
Independent Variables			
Participation in Real Disaster as Nurse	0.086		1.16
Job Description	0.289		1.59
Undergraduate Disaster Education	2.034		1.57
Covariates			
Race	6.177	5.511	
Ethnicity	3.437	3.512	
Additional Categorical Variables			
Gender	3.862	3.937	
Graduate Disaster Education	0.655		1.44
Trained in Facility Drills	6.898*		2.51
Continuing Education	10.261*		2.68
Participation in Real Disaster	1.082		1.60
Bioterrorism Preparation	3.620		1.74
Workplace Emergency Plans			
Knowledge of Workplace Emergency Plan	3.316	3.256	
Confidence in Workplace Emergency Plan	1.236	1.276	

Table 10 continued

Variable	Pearson Chi-Square Value	Fisher's Exact Test	Odds' Ratio ED vs non-ED = ED
Awareness of Preparedness of Community	11.850	11.532	
Desired Education			
Education on Role	2.348		0.59
Vulnerabilities	3.754		1.93
Health Promotion and Disease Prevention	0.435		1.21
Signs and Symptoms of Biological Agents	2.458		1.75
Treatment of Biological Agents	3.310		1.78
Community Resources	1.766		1.49
Recovery State Education	0.455		1.21
Facility Drills			
Occurrence of Regular Drills	20.764*		6.15
Effectiveness of Drills	9.596*		2.67

* $p < 0.05$

Independent Variables

Participation in a Disaster, Job Description, and Disaster Education

Table 10 shows the Pearson Chi-Square and odds ratios for the independent variables. Of the ED nurses, three (8.33%) stated that they had participated in a real disaster during their nursing career, while 33 (91.67%) had not. Of the non-ED nurses, seven (6.86%) stated that they

had participated in a real disaster during their nursing career, while 95 (93.14%) had not. Thirty-five (97.22%) of the ED participants identified as staff nurses, while one (2.78%) was a nurse manager. Ninety-seven (95.10%) of the non-ED participants were staff nurses, and five (4.90%) were nurse managers. Twenty-six (72.22%) of the ED participants indicated that they were educated about disasters in an undergraduate program, while 60 (58.82%) of the 102 non-ED were educated. Four (11.11%) of the ED nurses indicated they had received disaster education in a graduate program, while seven (6.86%) of the 102 non-ED nurses had received graduate-level disaster education.

For past participation in a disaster, the p -value for Fischer's Exact Test was 0.721, indicating that there was not a statistically significant difference in participation in a real disaster between ED and non-ED nurses. However, the odd's ratio demonstrated that ED nurses were 1.15 times more likely to have participated in a real disaster during their nursing career than non-ED nurses. For the job description, the p -value for Fischer's Exact Test was 1, indicating no statistically significant difference in the distribution of nursing position between ED and non-ED nurses. However, the odd's ratio indicated that ED nurses were 1.59 times more likely to be a staff nurse than a nurse manager. While there was not a statistically significant difference (p -value for Pearson Chi-Square was 0.168) for previous disaster education, the odd's ratio demonstrated that ED nurses were 1.57 times more likely to have received disaster education in an undergraduate program compared to non-ED nurses. The p -value for Fischer's Exact Test was 0.480, indicating that there was not a statistically significant difference in graduate disaster education between ED and non-ED nurses. However, ED nurses were 1.44 times more likely to have received disaster education in a graduate program compared to non-ED nurses.

Covariates

Race, Ethnicity, and Education

Table 10 shows the Pearson Chi-Square and Fisher's Exact Test for the covariates. Of the ED participants, zero (0%) identified as Asian, one (2.78%) as Black or African American, 33 (91.67%) as white, one (2.78%) preferred not to say, and one (2.78%) did not answer, while one (.98%) of the non-ED participants identified as Asian, zero (0%) as Black or African American, 100 (98.04%) as white, and one (.98%) did not answer. Of the ED participants, one (2.78%) identified as Hispanic or Latino, 33 (91.67%) as not Hispanic or Latino, one (2.78%) preferred not to say, and one (2.78%) did not respond. None (0%) of the non-ED participants identified as Hispanic or Latino, 97 (95.1%) were not Hispanic or Latino, one (.98%) preferred not to say, and four (3.92%) did not respond. Six (16.67%) of the ED participants had an associate's degree or diploma, 23 (63.89%) had a BSN, six (16.67%) had an MSN or higher, and one (2.78%) had an "other" degree. Six (5.88%) of the non-ED participants also had an associate's degree or diploma, while 88 (86.27%) had a BSN, seven (6.86%) had an MSN or higher, and one (.98%) had an "other" degree.

For race, the p -value for Fischer's Exact Test was 0.163, indicating no statistically significant difference in race distribution between ED and non-ED nurses. For ethnicity, the p -value for Fischer's Exact Test was 0.169, demonstrating no significant difference in the distribution of ethnicity between ED and non-ED nurses. For education, the p -value for Fischer's Exact Test was 0.020, demonstrating a statistically significant difference in education between ED and non-ED nurses.

Trained in Facility Drills

Twenty-nine (80.56%) of the ED nurses indicated that they had been trained in facility drills as an RN, while 57 (55.88%) of the 102 non-ED nurses indicated they had received training. The p -value for Pearson Chi-Square was 0.009, indicating a statistically significant difference between the groups. ED nurses were 2.51 times more likely to have been trained in facility drills as an RN compared with non-ED nurses.

Continuing Education

Twenty-six (72.22%) of the ED participants indicated that they have participated or participate in disaster-related continuing education, while 42 (41.18%) of the 102 non-ED nurses indicated involvement with continuing education. The p -value was 0.002, indicating a statistically significant difference between involvement in disaster-related continuing education between ED and non-ED nurses. ED nurses were 2.68 times more likely to have participated or currently participate in disaster continuing education than non-ED nurses.

Disaster Experience

Four (11.11%) of the ED nurses stated that they had participated in a disaster, six (5.88%) of the 102 non-ED nurses responded that they had participated in a disaster. The p -value for Fischer's Exact Test was 0.287, indicating that this was not a statistically significant difference. However, ED nurses were 1.60 times more likely to have participated in a disaster than non-ED nurses.

Bioterrorism Training

Fourteen (38.89%) of the 36 ED nurses responded that they had been formally prepared about what to do in bioterrorism disaster situations, while 23 (22.55%) of the non-ED nurses reported formal preparation. The p -value was 0.079, indicating no statistically significant

difference between the groups. However, ED nurses were 1.74 times more likely to have had formal preparation regarding bioterrorism disasters than non-ED nurses.

Workplace Emergency Plans

Awareness. Thirty-five (97.22%) of the ED nurses were aware that their workplace had an emergency plan, while one (2.78%) was unsure. Of the 102 non-ED nurses, 88 (86.27%) were aware, one (.98%) was not, and 13 (12.75%) were unsure. The p -value for Fischer's Exact Test was 0.219, indicating no statistically significant difference in awareness of a disaster plan between the groups.

Execution. Of the 36 ED nurses, ten (27.78%) were confident that the emergency plan would be well executed in the case of a disaster, 14 (38.89%) were not confident, and 12 (33.33%) were not sure. Of the non-ED nurses, 27 (26.47%) were confident in the execution of the emergency plan, 31 (30.39%) were not, and 44 (43.14%) were not sure. The p -value was 0.553, indicating no statistically significant difference between the groups in confidence.

Preparedness of Healthcare Systems

Fifteen (41.67%) of the ED nurses stated that they were aware of the level of preparedness of the healthcare systems in their community, while 16 (44.44%) were not aware, and five (13.89%) were not sure. Of the non-ED nurses, 17 (16.67%) were aware, 47 (46.08%) were not, and 38 (37.25%) were not sure. There was a statistically significant difference between the groups regarding awareness of community preparedness ($p = 0.003$).

Desired Education

Role in Disaster. Twenty-eight (77.78%) ED nurses desired education regarding their role in a disaster, while 90 (88.24%) of the 102 non-ED nurses desired this education. The p -value was 0.167, indicating that there was not a statistically significant difference between the

groups on desired education about their role, but non-ED nurses were 1.27 times more likely to desire this education.

Community Vulnerabilities. Twenty-eight (77.78%) of the ED nurses desired education regarding potential vulnerabilities existing in their community in case of a disaster, while 61 (59.80%) non-ED nurses desired this education. The p -value was 0.068, indicating that there was not a statistically significant difference between the groups. However, ED nurses were 1.93 times more likely to desire vulnerability education than non-ED nurses.

Health Promotion, Protection, and Disaster Prevention. Twenty (55.56%) of the ED nurses and 53 (51.96%) non-ED nurses desired education on how to respond and assure health promotion, protection, and disaster prevention in community settings such as clinics or doctor's offices in case of disaster. Although this was not a statistically significant difference ($p = 0.563$), ED nurses were 1.21 times more likely to desire this education compared to non-ED nurses.

Identification of Signs and Symptoms of Biological Agents. Twenty-nine (80.56%) ED nurses and 68 (66.67%) non-ED nurses desired more education regarding biological agents and ways to identify their signs and symptoms. There was not a statistically significant difference between the groups ($p = 0.140$). However, ED nurses were 1.75 times more likely to desire this education.

Treatment of Biological Agents. Twenty-six (72.22%) ED nurses and 56 (54.90%) non-ED nurses desired more education regarding biological agents and their differential diagnosis and treatments. This was not a statistically significant difference ($p = 0.078$), but ED nurses were 1.78 times more likely to desire this education than non-ED nurses.

Community Resources. Twenty-four (66.67%) of the ED nurses and 55 (53.92%) of the non-ED nurses were interested in education regarding resources in their community, such as

agencies for referral, health departments, emergency contacts, the chain of command, and community shelters. This difference was not statistically significant ($p = 0.240$), but ED nurses were 1.49 times more likely to be interested in this education than non-ED nurses.

Recovery State. Twenty (55.56%) ED nurses and 50 (49.02%) non-ED nurses were interested in more education regarding recovery state and acute stress disorder, post-traumatic stress disorder, and crisis intervention. There was not a statistically significant difference between the groups ($p = 0.563$). However, ED nurses were 1.21 times more likely to be interested in this education.

Facility Drills

Of the 36 ED nurses, 32 (88.89%) responded that they have regular disaster or emergency drills in their workplace, while 46 (45.10%) of the 102 non-ED nurses responded that they had regular drills. This was a statistically significant difference ($p = 0.000$), with ED nurses 6.15 times more likely to report regular drills than non-ED nurses. Twenty-four (72.72%) of the 33 ED nurses responded that the regular drills were helpful, while 33 (40.74%) of the 81 non-ED nurses felt that drills were helpful. This was a statistically significant difference ($p = 0.003$), with ED nurses being 2.67 times more likely to find regular drills effective or helpful.

Aim 3

Aim 3 was to examine the association between individual, unit, and organizational characteristics associated with disaster preparedness among nurses in the pediatric hospital. The independent variables (participation in a real disaster, disaster education, unit type, and job description) were chosen based on the Theory of Self-Efficacy, and will be addressed with each hypothesis. There are four main pillars in the Theory of Self-Efficacy: performance accomplishment, emotional arousal, vicarious experience, and verbal persuasion. Regression was

used to explore the influence of the independent variables on the dependent variables, while controlling for the highest level of education obtained.

Regression Analysis

The regression analysis will be discussed individually for each dependent variable. Regression allows for the determination of which factors influence or predict disaster preparedness, response abilities, recovery preparedness, and overall disaster preparedness, while controlling for the highest level of education. Regression allows for the use of multiple independent variables in these predictions. This analysis used the independent variables of participation in a real disaster, unit type, and disaster education to predict scores on disaster preparedness, response abilities, recovery preparedness, and overall preparedness, while controlling for the highest level of education obtained.

Regression Model Building

Hierarchical linear regression was used. This method allows for multiple regression models to be run to determine which independent variables influence the dependent variable, while controlling for the covariate (Kim, 2016). In this study, the covariate was the highest level of education, and the independent variables were participation in a real disaster, unit type, and disaster education. The first model run on each regression consisted of the covariate and the given dependent variable (disaster preparedness, response abilities, recovery preparedness, and overall disaster preparedness). The second model run on each regression included the covariate and the independent variables.

To determine which independent variables (participation in a real disaster, unit type, and previous disaster education) could predict the dependent variables (disaster preparedness, response abilities, recovery preparedness, and overall preparedness), regressions were run as

described below, while controlling for the highest level of education. Models 1a, 1b, 1c, and 1d, solely include the covariate (highest level of education) as a predictor. Models 2a, 2b, 2c, and 2d, include the independent variables. These are discussed for each of the dependent variables.

Disaster Preparedness. Model 1a (covariate) contains the covariate of highest level of education (Table 11). The adjusted R^2 for model 1 was -.005, indicating that the highest level of education alone is not a good predictor of disaster preparedness. In model 2a, the independent variables (disaster education, unit type, and participation in a real disaster) were factored in with the covariate and the adjusted R^2 was .046, indicating that 4.6% of the variability in disaster preparedness can be predicted by the covariate and independent variables. The p -value for model 1 was .571, indicating that the highest level of education alone was not a statistically significant predictor of disaster preparedness. The p -value for model 2 was .038, indicating that the model was a statistically significant predictor of disaster preparedness.

Table 11
Regression Statistics for Disaster Preparedness Score

Disaster Preparedness	R	R^2	Adjusted R^2	R^2 Change
1a	.049	.002	-.005	.002
2a	.272	.074	.046	.072*

* $p < .05$

Table 12 shows the model statistics for the covariate and independent variables. Participation in a real disaster was not statistically significant ($p = .058$). While controlling for the highest level of education, unit type was a statistically significant unique predictor of disaster preparedness ($p = .033$). Disaster education was not statistically significant ($p = .183$).

Table 12*Model Statistics for Covariate and Independent Variables for Disaster Preparedness*

Variable	1a			2a		
	B	β	SE	B	β	SE
Constant	3.061		.201	4.561		.550
Highest Level of Education	.101	.049	.178	.023	.011	.176
Participation in Real Disaster				-.395	-.170	.206
Unit Type				-.257*	-.186	.119
Disaster Education				-.150	-.120	.113

* $p < .05$

Response Abilities. Model 1b included highest level of education (Table 13). The adjusted R^2 for model 1 was -.006, indicating that the highest level of education alone is not a good predictor of disaster preparedness. In model 2, the independent variables (disaster education, unit type, and participation in a real disaster) were factored in with the covariate and the adjusted R^2 was .103 indicating that 10.3% of the variability in disaster preparedness can be predicted by the covariate and independent variables. The p -value for model 1 was 0.719, indicating that the highest level of education was not a statistically significant predictor of disaster preparedness. The p -value for model 2 was 0.001, indicating that the model was a statistically significant predictor of disaster preparedness.

While controlling for the highest level of education, participation in a real disaster, unit type, and disaster education were significant predictors, with p -values of .019, .036, and .002, respectively (Table 14).

Table 13
Regression Statistics for Response Abilities Score

Response Abilities	R	R ²	Adjusted R ²	R ² Square
1b	.031	.001	-.006	.001
2b	.360	.129	.103	.129*

* $p < .05$

Table 14
Model Statistics for Covariate and Independent Variables for Response Abilities

Variable	1b			2b		
	B	β	SE	B	β	SE
Constant	3.234*		.255	5.621*		.676
Highest Level of Education	-.081	-.031	.225	-.159	-.061	.216
Participation in Real Disaster				-.603*	-.205	.253
Unit Type				-.310*	-.177	.146
Disaster Education				-.439*	-.276	.138

* $p < .05$

Recovery Preparedness. Model 1c included highest level of education (Table 15). The adjusted R² for model 1 was -.006, indicating that the highest level of education is not a good predictor of disaster preparedness. In model 2c, the independent variables (disaster education, unit type, and participation in a real disaster) were factored in with the covariate and the adjusted R² was .068, indicating that 6.8% of the variability in disaster preparedness can be predicted by the covariate and independent variables. The p -value for model 1 was .616, indicating that the highest level of education was not a statistically significant predictor of disaster preparedness.

The p -value for model 2 was .010, indicating that the model was a statistically significant predictor of disaster preparedness.

Table 15
Regression Statistics for Recovery Preparedness Score

Recovery Preparedness	R	R ²	Adjusted R ²	R ² Square
1c	.043	.002	-.006	.002
2c	.309	.096	.068	.094*

* $p < .05$

While controlling for the highest level of education, participation in a real disaster and unit type were not significant predictors of recovery preparedness (Table 16). However, disaster education was a significant predictor ($p = 0.005$) of recovery preparedness.

Table 16
Model Statistics for Covariate and Independent Variables for Recovery Preparedness

Variable	1c			2c		
	B	β	SE	B	β	SE
Constant	3.163*		.306	5.324*		.826
Highest Level of Education	-.135	-.043	.270	-.195	-.062	.264
Participation in Real Disaster				-.466	-.133	.309
Unit Type				-.305	-.145	.179
Disaster Education				-.487*	-.256	.169

* $p < .05$

Overall Preparedness. Model 1d included highest level of education (Table 17). The adjusted R^2 for model 1 was $-.007$, indicating that the highest level of education is not a good predictor of disaster preparedness. In model 2d, the independent variables (disaster education, unit type, and participation in a real disaster) were factored in with the covariate and the adjusted R^2 was $.083$ indicating that 8.3% of the variability in disaster preparedness can be predicted by the covariate and independent variables. The p -value for model 1 was $.948$, indicating that the highest level of education was not a statistically significant predictor of disaster preparedness. The p -value for model 2 was 0.004 , indicating that the model was a statistically significant predictor of disaster preparedness.

Table 17
Regression Statistics for Overall Preparedness Score

Overall Preparedness	R	R^2	Adjusted R^2	R^2 Change
1d	.006	.000	-.007	.000
2d	.332	.110	.083	.110*

* $p < .05$

While controlling for the highest level of education, participation in a real disaster, unit type, and disaster education were all statistically significant predictors of overall preparedness, with p -values of $.026$, $.023$, and $.014$, respectively (Table 18).

Assumptions of Regression. The six assumptions of regression (representativeness of the sample, normality of the distribution of errors, absence of homoscedasticity, linear relationship between the independent variables and the dependent variable, independent selection, and absence of multicollinearity) were tested and will be discussed.

Table 18*Model Statistics for Covariate and Independent Variables for Overall Preparedness*

Variable	1d			2d		
	B	β	SE	B	β	SE
Constant	3.132*		.210	5.009*		.562
Highest Level of Education	.012	.006	.185	-.064	-.030	.180
Participation in Real Disaster				-.474*	-.196	.211
Unit Type				-.281*	-.195	.122
Disaster Education				-.287*	-.219	.115

* $p < .05$

1. Representativeness of Sample. A weakness of the convenience sampling used is that the sample is often not representative of the population (Polit & Beck, 2004). The ED appeared to have a higher percentage of participation than non-ED nurses, which could have affected overall results, although there is not a way to confidently assess the representativeness of the sample given the information available in the study.

2. Normality of the Distribution of Errors. The normality of the distribution of errors is determined by examining the distribution of standardized residuals in a histogram. The assumption is that the dependent variable is normally distributed for each level of each independent variable. If this assumption is correct, the distribution of residuals should also be normally distributed (Kellar & Kelvin, 2013). Figures 4-7 indicate a reasonably normal distribution of errors. The normal curve was added to each figure to help visualize the normality of the distribution of the standardized residuals. There are no significant outliers, and the majority of residuals fall within the normal curve. Figure 4 shows the distribution of errors for disaster preparedness. The mean is 1.78E-15, with a standard deviation of .99. There are no

significant outliers, as those points on both ends of the histogram are along the normal curve. There is an elevation above the normal curve around -.5. However, overall, the values are close to the normal curve, indicating a normal distribution.

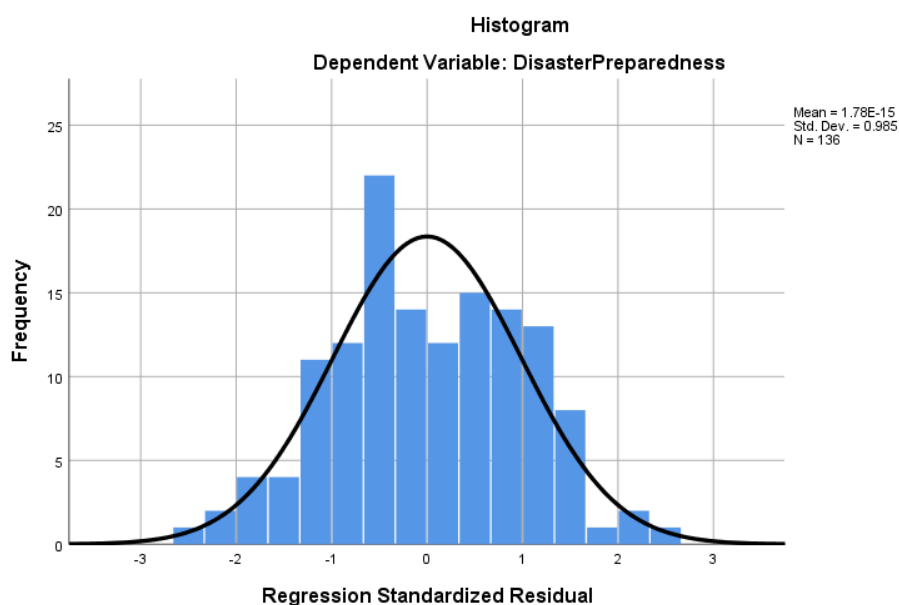


Figure 4
Histogram Depicting the Distribution of Errors for Disaster Preparedness

Figure 5 illustrates the distribution of errors for response abilities. The mean is 9.04E-16, with a standard deviation of .99. There are no obvious outliers, and the overall distribution falls close to the normal curve, indicating a normal distribution.

Figure 6 depicts the distribution of errors for recovery preparedness. The mean was 6.11E-16, with a standard deviation of .99. There was one outlier, which still fell within the normal curve. Data was analyzed to determine if data entry error could be responsible. There were no entry errors found, and as it still fell within the normal curve distribution, all data points

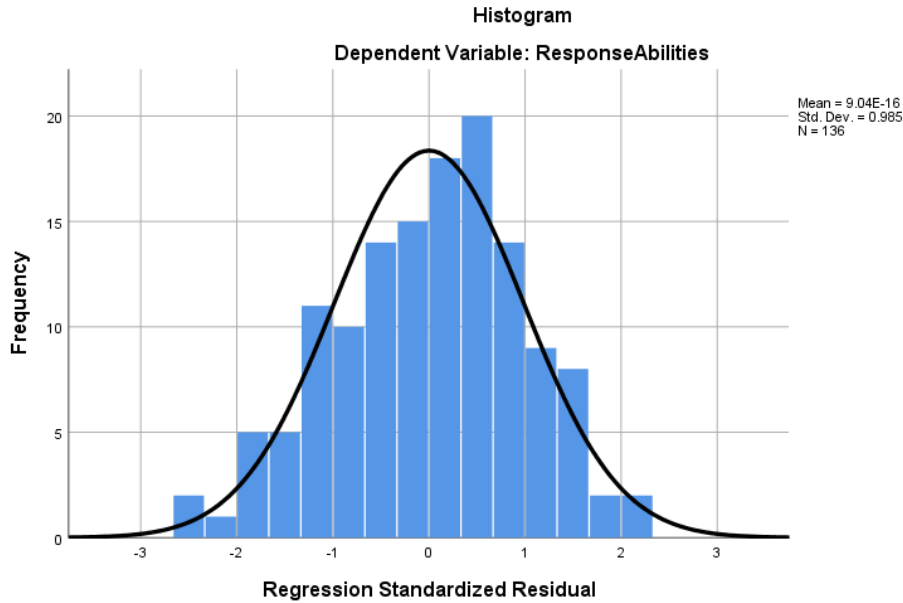


Figure 5
Histogram Depicting the Distribution of Errors for Response Abilities

were left in for analysis. The distribution for recovery preparedness did not fall as well along the normal curve as disaster preparedness and response abilities, but was still close to the normal curve, indicating a normal distribution.

Figure 7 illustrates the distribution of errors for overall preparedness. The mean was $-1.08\text{E-}15$, with a standard deviation of .99. The distribution appears to follow the normal curve, indicating a normal distribution.

3. Homoscedasticity. Homoscedasticity assumes that the variance of residuals is similar for the predicted values (Bannon, 2013). If the residuals are normally distributed (have a similar variance), the values should form a straight line with a positive slope, indicating homoscedasticity (Kellar and Kelvin, 2013). The figures (Figures 8-11) below demonstrate that residuals for each dependent variable (disaster preparedness, response abilities, recovery

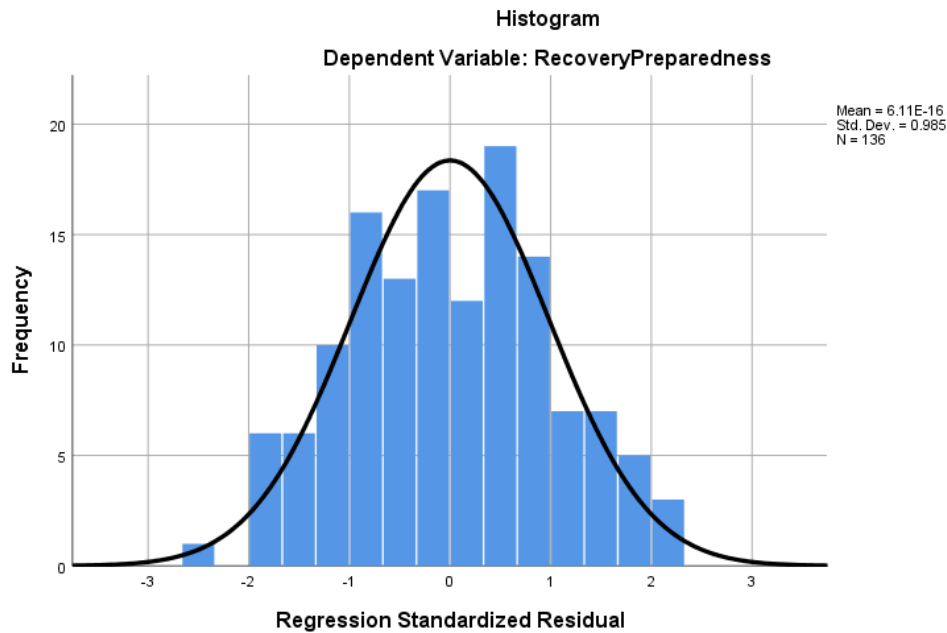


Figure 6

Histogram Depicting the Distribution of Errors for Recovery Preparedness

preparedness, and overall preparedness) fall on a straight line with a positive slope. The residuals are evenly dispersed. If residuals were spaced further from the line at either end, or randomly distributed along the line, heteroscedasticity would be present. Figures 8-11 shows the residual analyses below indicating homoscedasticity, as the variance of errors is similar for each independent variable around the regression line, and the residuals form a straight line. Therefore, the assumption of homoscedasticity was met.

4. Linear Relationship Between the Independent Variables and the Dependent

Variable. This assumption addresses the relationship between the independent variables and the dependent variable, which should be linear. In this study, all of the independent variables were dichotomous, and therefore, this assumption does not apply.

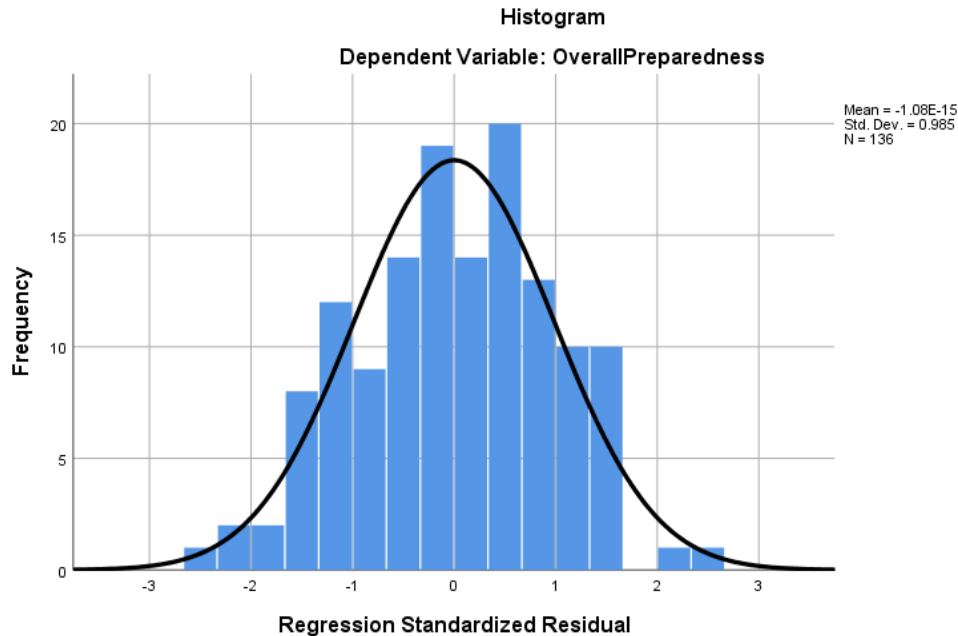


Figure 7

Histogram Depicting the Distribution of Errors for Overall Preparedness

5. Independent Selection. Independent selection assumes that each participant is selected independently from the population of interest and that each participant's answers are independent from the responses of others (Keith, 2015). All eligible staff were invited to participate and had the option of completing the survey at work or at home. Participation was strictly voluntary. As all the nurses worked in the same facility and some are separated by units, this assumption was unable to be verified, and is one limitation of the research design.

6. Multicollinearity. Multicollinearity examines the relationship and correlation between variables (Table 19). If variables are too highly correlated, data analysis will not be able to distinguish each variable in the regression (Kellar & Kelvin, 2013; Bannon, 2013). Correlations were used to examine this assumption (Bannon, 2013). Of the covariates, age and years as an RN were highly correlated at .84 (Table 19), so these variables were removed from the data analysis.

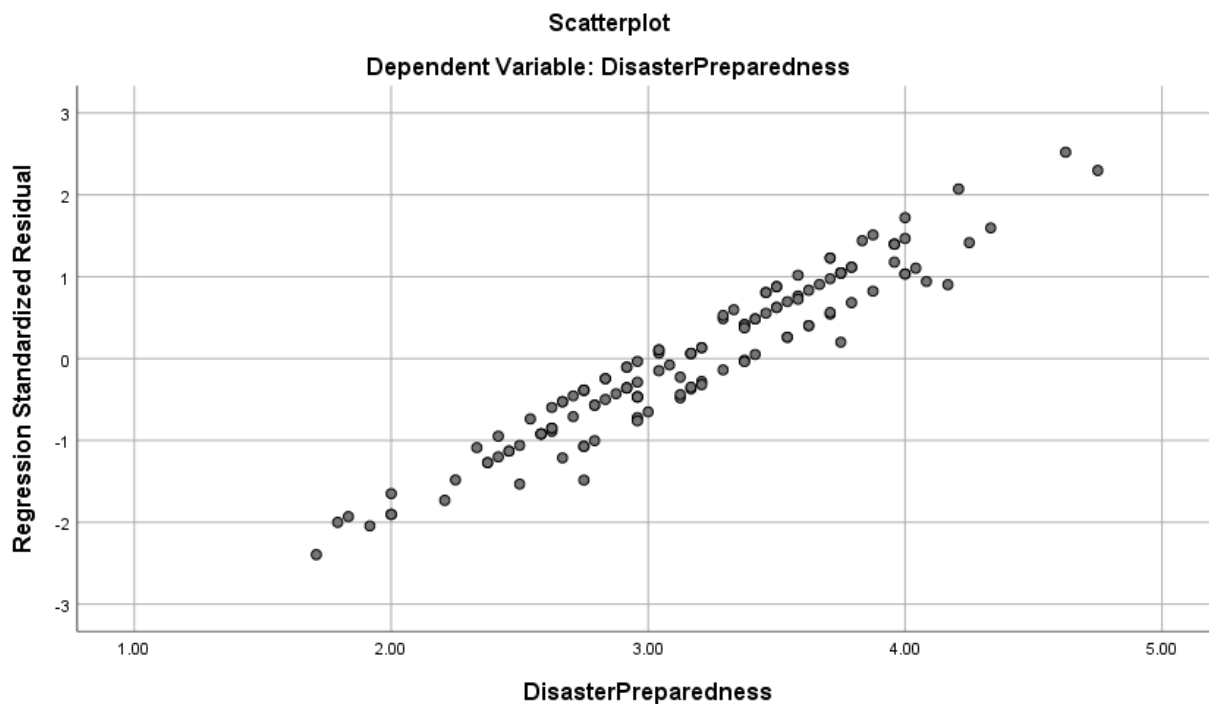


Figure 8
Scatterplot Depicting the Variance of Errors for Disaster Preparedness

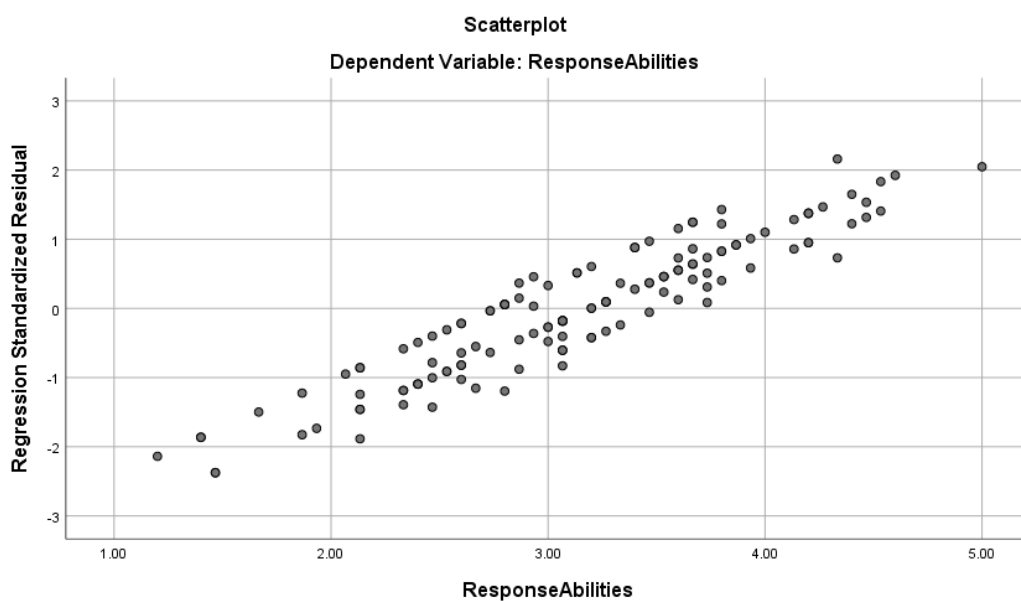


Figure 9
Scatterplot Depicting the Variance of Errors for Response Abilities

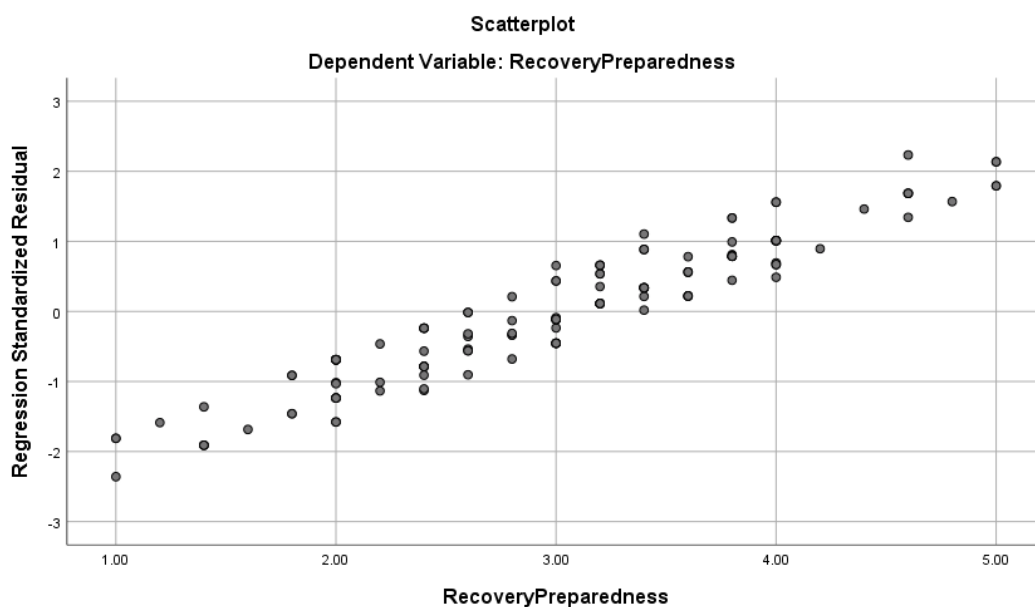


Figure 10
Scatterplot Depicting the Variance of Errors for Recovery Preparedness

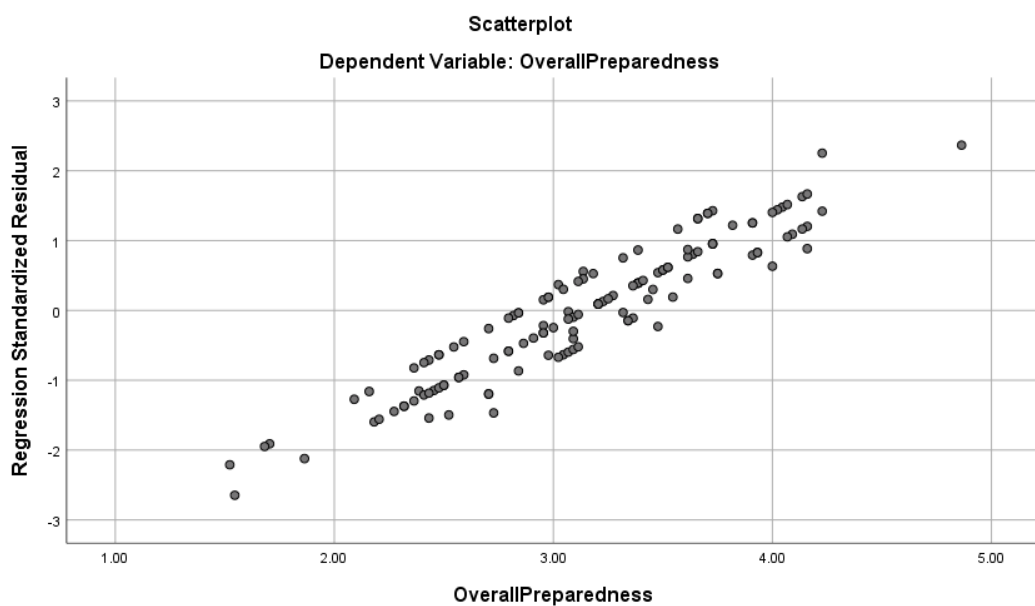


Figure 11
Scatterplot Depicting the Variance of Errors for Overall Preparedness

The highest level of education was the only covariate that had enough variation in data (race and ethnicity did not have enough variation to run statistical tests) and was not highly correlated with other covariates and independent variables to be used as a covariate. The correlation between highest level of education and age was .250. The correlation between highest level of education and years as an RN was .258. The correlation between highest level of education and participation in a real disaster was -.100. The correlation between highest level of education and unit type was -.152. The correlation between highest level of education and disaster education was .063. Correlations range from -1 to +1, with values closer to -1 and +1 showing perfect correlation, and a value of 0 would indicate no correlation (Polit & Beck, 2004). Correlations for these variables ranged from -.100 to .258, indicating that the individual independent variables are not strongly correlated with each other and are distinct enough to be used as predictor variables in the regression.

Table 19
Correlations Between Covariates and Independent Variables

Variable	1	2	3	4	5	6
1. Age	-	.836*	.250*	-.148*	-.020	.391*
2. Years as RN	.836*	-	.258*	-.228*	-.031	.388*
3. Highest Level of Education	.250*	.258*	-	-.100	-.152*	.063
4. Participation in Real Disaster	-.148*	-.228*	-.100	-	.027	-.311*
5. Unit Type	-.020	-.031	-.152*	.027	-	.135
6. Disaster Education	.391*	.388*	.063	-.311*	.135	-

*p < .05

After eliminating age and years as an RN, the regression was rerun, with the correlations shown in Table 20. There were still statistically significant correlations between disaster education and participation in a real disaster and unit type and highest level of education. However, their correlations were well below the threshold of .85 stated by Kellar and Kelvin (2013), and were still included for regression analysis. While age and years as an RN did not quite reach this threshold (.836), these variables were close to the limit and more highly correlated than any other variables, prompting their removal from the regression.

Table 20
Correlations Between Remaining Covariates and Independent Variables

Variable	1	2	3	4
1. Highest Level of Education	-	-.139	-.152*	.063
2. Participation in Real Disaster	-.100	-	.027	-.311*
3. Unit Type	-.152*	.027	-	.135
4. Disaster Education	.063	-.311*	.135	-

*p < .05

There is a correlation of -.100 between the highest level of education and participation in a real disaster. There is a correlation of -.152 between highest level of education and unit type. There is a correlation of .063 between the highest level of education and disaster education. There is a correlation of .027 between participation in a real disaster and unit type. There is a correlation of -.311 between participation in a real disaster and disaster education. There is a correlation of .135 between unit type and disaster education.

Variation Inflation Factor (VIF) was also used to examine the assumption of multicollinearity (Bannon, 2013). One common limit that is used is 10.0, meaning that if the VIF

was greater than 10, the independent variables are too closely related (Bannon, 2013). The Variance Inflation Factor for variables ranged from 1.037-1.137, which is within the acceptable range, indicating no multicollinearity, as displayed in Table 21.

Table 21
Collinearity Statistics for Covariate and Independent Variables

Variable	Collinearity Statistics	
	Tolerance	VIF
Highest Level of Education	.964	1.037
Participation in Real Disaster	.893	1.119
Unit Type	.952	1.050
Disaster Education	.880	1.137

Testing Hypotheses

Several statistical methods were used to test the hypotheses. T-tests were used to determine differences between several subgroups of participants for the dependent variables. Mean scores for disaster preparedness, response abilities, recovery preparedness, and overall preparedness were calculated and compared between those with prior disaster experience and those without, those who worked in the ED and those who worked in other units, and those who had previous disaster education and those who did not.

Hypothesis 1. Performance accomplishment describes how past experiences increase one's self-efficacy. The study investigated the potential influence of prior disaster experience on the level of disaster preparedness. Hypothesis 1 was that nurses with previous disaster experience would be more prepared for disasters than those without prior experience. To address this

hypothesis, participants were asked “Over your nursing career, have you ever participated in a real disaster situation?”

Table 22 shows the mean scores of the dependent variables those who have and have not participated in a real disaster. Of the ten participants who responded that they had participated in a real disaster in their nursing career, the mean score for disaster preparedness was 3.47, compared with a mean of 3.14 for those who had not participated in a disaster. The mean score for response abilities for the participants who had participated in a disaster was 3.47, while the mean was 3.11 for those who had not participated in a disaster. The mean score for recovery preparedness was 3.18 for those who had participated in a disaster, while the mean was 2.99 for those who had not. The mean score for overall preparedness was 3.44 for those with disaster experience and 3.11 for those who did not have disaster experience. None of these findings were statistically significant ($p = .980$ for disaster preparedness, $p = .161$ for response abilities, $p = .536$ for recovery preparedness, and $p = .120$ for overall preparedness), and therefore, the hypothesis that nurses with previous disaster nursing would be more prepared for disasters than those without prior experience was not supported.

Hypothesis 2. Those who have experience in situations with emotional arousal may exhibit higher levels of self-efficacy. When applied to disaster preparedness, ED nurses frequently deal with stressful situations and overcrowding. The study aimed to explore the relationship between the type of unit and disaster preparedness. Hypothesis 2 was that nurses working in the ED would be more prepared for disasters than non-ED nurses.

Table 23 shows the mean scores of the dependent variables for ED and non-ED nurses. Thirty-six nurses worked in the ED, while 102 did not work in the ED. The mean score for ED nurses

Table 22

Mean Scores of Dependent Variables for Those Who Have and Have Not Participated in a Real Disaster

Variable	Participation in Real Disaster	Mean	Mean Difference	Standard Deviation
Disaster Preparedness	Yes	3.47		.445
	No	3.14		.613
			.33	
Response Abilities	Yes	3.47		.460
	No	3.11		.781
			.36	
Recovery Preparedness	Yes	3.18		.600
	No	2.99		.940
			.19	
Overall Preparedness	Yes	3.44		.425
	No	3.11		.640
			.33	

for disaster preparedness was 3.38, versus the mean for non-ED nurses was 3.09. The mean score for response abilities for ED nurses was 3.39, versus the mean was 3.05 for non-ED nurses. The mean score for recovery preparedness for ED nurses was 3.27, versus the mean was 2.92 for non-ED nurses. The mean score for overall preparedness for ED nurses was 3.37, versus the mean was 3.06 for non-ED nurses. These findings all indicated a statistically significant difference between ED and non-ED nurses for scores on all four variables ($p = .015$ for disaster preparedness, $p = .020$ for response abilities, $p = .043$ for recovery preparedness, and $p = .010$ for overall preparedness). Therefore, the hypothesis that nurses working in the ED would be more prepared for disasters than non-ED nurses was supported.

Table 23
Mean Scores of Dependent Variables for ED and Non-ED Nurses

Variable	Unit Type	Mean	Mean Difference	Standard Deviation
Disaster Preparedness	ED	3.38		.59
	Non-ED	3.09	.28*	.60
Response Abilities	ED	3.39		.72
	Non-ED	3.05	.34*	.77
Recovery Preparedness	ED	3.27		.83
	Non-ED	2.91	.36*	.94
Overall Preparedness	ED	3.37		.60
	Non-ED	3.06	.31*	.62

* $p < .05$

Hypothesis 3. Vicarious experience describes the positive influence of training and education on self-efficacy. One's self-efficacy can increase by learning and hearing about situations, even if one has not personally experienced the situation. This study aimed to explore the influence of disaster education on levels of preparedness. Hypothesis 3 was that nurses with prior disaster education would be more prepared for disasters than those without prior training. This hypothesis was addressed by the following survey question: I was educated about disasters in an undergraduate nursing program.

Table 24 shows the mean scores for nurses with and without prior disaster training. Eighty-six (62.32%) participants responded that they had received disaster education in an undergraduate program, while 52 (37.68%) did not. The mean score for disaster preparedness for those who had received education was 3.21, while the mean was 3.08 for those who had not. The

mean score for response abilities was 3.29 for those who had received education and 2.90 for those who had not received education. The mean score for recovery preparedness was 3.18 for those with education, and 2.72 for those without. The mean for overall preparedness for those with education was 3.23, while the mean was 2.98 for those who had not received disaster education in an undergraduate program. There was not a significant difference between the groups for disaster preparedness ($p = .220$). There was a significant difference between the groups for response abilities ($p = .003$), recovery preparedness ($p = .004$), and overall preparedness ($p = .020$). Therefore, the hypothesis that nurses with prior disaster training would be more prepared for disasters than those without prior training was not supported for disaster preparedness, but was supported for response abilities, recovery preparedness, and overall preparedness.

Table 24
Mean Scores of Dependent Variables for Nurses With and Without Prior Disaster Training

Variable	Disaster Education	Mean	Mean Difference	Standard Deviation
Disaster Preparedness	Yes	3.21	.13	.63
	No	3.08		.57
Response Abilities	Yes	3.29	.39*	.78
	No	2.90		.68
Recovery Preparedness	Yes	3.18	.47*	.94
	No	2.72		.82
Overall Preparedness	Yes	3.23	.26*	.64
	No	2.98		.59

* $p < .05$

Hypothesis 4. Verbal persuasion often occurs from leadership and those with experience in a given situation in the form of encouragement. This study aimed to investigate the influence of those in a nursing leadership position on levels of disaster preparedness. Hypothesis 4 was that nurse managers would be more prepared for disasters than non-nurse managers (staff nurses). This variable was addressed by having participants select which more closely resembled their job description: staff nurse or nurse manager. A power analysis revealed that 135 nurses was the required sample size to detect differences in disaster preparedness based on numerous factors, if the differences did exist. While this number was reached, there were only six nurse managers who participated, which was not a sufficient number to statistically test this hypothesis.

Overview of Regression

Hierarchical linear regression was used to test the effects of the covariate (highest level of education) and the independent variables (participation in a real disaster, unit type, and disaster education) on each dependent variable (disaster preparedness, response abilities, recovery preparedness, and overall disaster preparedness). For all for dependent variables, the models with the covariate and independent variables were statistically significant predictors of disaster preparedness, response abilities, recovery preparedness, and overall preparedness. Overall preparedness was determined by obtaining a mean score on the other three dependent variables.

While controlling for the highest level of education, only the unit type was found to be a statistically significant predictor of disaster preparedness, all three independent variables were statistically significant predictors of response abilities. Only disaster education was a statistically significant predictor of recovery preparedness. All three independent variables were statistically significant predictors of overall preparedness.

Summary

In summary, there was no statistically significant difference between prior disaster nursing experience and scores on disaster preparedness, response abilities, recovery preparedness, or overall preparedness. However, there was a statistically significant difference between ED and non-ED nurses among all four dependent variables, indicating a positive association between working in the ED and higher levels of preparedness for disaster preparedness, response abilities, recovery preparedness, and overall preparedness. Unit type was a statistically significant predictor of disaster preparedness, response abilities, and overall preparedness. Disaster education was a statistically significant predictor of response abilities, recovery preparedness, and overall preparedness. Participation in a real disaster was a statistically significant predictor of response abilities and overall preparedness.

Chapter 5: Discussion

Introduction

The purpose of this dissertation research study was to assess the disaster preparedness of hospital-based pediatric nurses. To conduct this study, the Disaster Preparedness Evaluation Tool (DPET) was administered to nurses at a Midwestern level 1 pediatric trauma center to assess their perceived personal and professional disaster preparedness. An adequate sample was obtained, and analysis included t-tests and linear regression. There were no significant differences on disaster or recovery preparedness scores between those with and without prior disaster experience. There were significant differences on all disaster scores when comparing ED and non-ED nurses, with ED nurses scoring higher for each category. Those with and without prior disaster education demonstrated significant differences on three of the four preparedness scores, with prior education positively influencing scores. This chapter will include a further analysis of each aim, including findings, explanations, and any support from literature. Hypotheses will be discussed, including reasons they were or were not supported by the data. Implications and future research, as well as limitations of the study, will also be discussed.

Discussion of Study Findings

Aim 1

The purpose of Aim 1 was to describe disaster preparedness among registered nurses. Overall, nurses in this study were not prepared for a disaster. First, only 62.32% of nurses at the hospital had participated in drills, indicating a lack of training. Other scholars have reported similar findings among healthcare workers in Singapore, where only 19.8% of those surveyed had participated in disaster training (Lim, Lim, & Vasu, 2013), while King, Spritzer, and Al-Azzeh (2019) found that 55.6% of American military health professional had participated in

facility drills. One possible explanation for the study finding might be that there is a lack of guidelines specifying how many staff must participate in drills. The Joint Commission (2016) only has requirements for the number of drills a hospital must conduct, but not how often a given staff member must participate. Another reason for this result might be that some required yearly drills can be table-top exercises, which do not provide an opportunity for most staff to participate (AAP, 2017).

Second, participants were not well-trained in triage. This finding was inconsistent with the recommendations in the 2008 CBPPPTF report. One reason for this finding may be that many of the participants were non-ED nurses. Typically, the ED nurses received more training on disaster triage than non-ED nurses. However, as emphasized in the CBPPPTF report, it is important for all nurses to at least have a basic understanding of the principles of disaster triage so they have a better understanding of patient status and potential issues upon admission (CBPPPTF, 2008). Therefore, in the future, there is an opportunity to increase training for all nurses in disaster triage.

Third, participants were not adequately prepared for the recovery phase of a disaster. Some of the recovery questions focused on recognizing PTSD and reactions of survivors. This finding did not reflect the emphasis on mental health and disasters recommended in the 2010 NCCD report. One possible explanation for this finding is the lack of national requirements for disaster education or training providers in monitoring patients post-disaster. This was supported by the American Nurses Association (2020), which stated that while many programs are including disaster education in their curricula, all nurses do not receive this education, and the organization encourages nurses to seek additional training and certifications to remain current in their disaster knowledge. Another reason might be that much of the education that is often

provided for nurses seems to focus on preparation and response, without much emphasis on recovery. The International Council of Nurses (2019) recently updated their Core Competencies in Disaster Nursing, which are made up of eight domains, one of which is recovery. Mental health was not included as a topic in the original competencies in 2009. The hope is that nursing schools and other nursing bodies adopt this updated publication, and begin including mental health assessments as a focus area for education.

Fourth, most healthcare workers and institutions are not prepared for disasters. The overall preparedness mean demonstrated fairly low scores, with the majority of answers close to “somewhat disagree.” One potential explanation is that there is an overall lack of training opportunities for nurses, which would have a negative impact on their preparedness (Rassin et al., 2007; Lim, Lim, & Vasu, 2013). Another explanation might be that nurses have received some disaster education but have not put it into practice, and may therefore feel less confident about their abilities (Sonneborn et al., 2018). However, one study finding showed a positive aspect of preparedness. Among participants, 89.13% were aware that the facility had an emergency plan, which was supported by the findings of Whetzel et al. (2013), where 97.7% of participants were aware that their facility had a plan. One reason for the finding might be that many facilities have their policies in an online database, so even if staff was not familiar with the contents of the plan, they would know where to access it, though no studies have looked into the impact of accessibility. Second, often before any type of drill or exercise, unit leadership will remind staff where plans are, and may review the plans with staff.

Aim 2

The purpose of Aim 2 was to compare disaster preparedness between nursing units (ED and non-ED). ED nurses were found to be more prepared than non-ED nurses. First, ED nurses

had more experience training in facility drills, participated in more continuing education, and had more opportunities to participate in drills than non-ED nurses. This is in accordance with the findings of Ratnapalan et al. (2013) who determined that education and training conducted at the unit level may positively influence the disaster preparedness of staff.

In this study, the percentage of ED nurses who had participated in a drill was 80.56%, which was much higher than the 55.9% reported by Whetzel et al. (2013). One explanation for this finding is that ED nurses have more opportunities to participate in drills and other educational opportunities, which would increase their levels of preparedness (Fox & Timm, 2008). Another possible reason for higher levels of preparedness might be that as the ED is involved in essentially all large-scale drills at the facility, they likely have the broadest scope of practice regarding preparedness, although this has not been addressed in the literature. This might also give them an advantage over non-ED nurses and increase their levels of preparedness.

Second, the results of this study indicated that more ED nurses had received disaster education than non-ED nurses. Similar results were obtained by other researchers, who found a lack of education for non-ED nurses (Fox & Timm, 2008), and a greater familiarity with preparedness among ED nurses compared with non-ED nurses (Hodge, Miller, & Skaggs, 2017). However, one research team obtained different results, demonstrating that OR nurses had actually received more education than ED nurses (Sonneborn et al., 2018). One explanation for the difference in findings is that all the studies did not break down the unit to include the OR separately. It is possible that the current study may have found differences between the OR and ED, although there were not enough OR nurses to conduct this analysis. Secondly, the difference between OR and ED was not explored in other studies, so it is unknown if similar patterns would be seen if that study were repeated. In addition, as a single-center study, it is unknown if there

were certain circumstances that may have impacted the increased education of the OR staff. For example, Lim, Lim, and Vasu (2013) found that HCWs at hospitals which had experienced SARS and H1N1 outbreaks and had regular training had increased confidence that their facility would be able to respond to a disaster. While not the same situation as the OR, it demonstrates that regional experiences at a facility might impact training. It is possible that there was an event in the OR that necessitated a preparedness or education intervention.

While there were many differences between the ED and non-ED nurses, there were also some similarities. First, there were similar levels of knowledge of, and confidence in, the workplace emergency plan, but this has not been included in other studies. However, one explanation for this finding might be that awareness of a plan might affect one's confidence in its execution. However, this issue has not been explored. Another reason might be that all the nurses in this study were from a single institution. Lim, Lim, and Vasu (2013) found that confidence in leadership influenced feelings of preparedness. It is possible, therefore, that similar confidence in the workplace emergency plan was due to the participants having the same senior leadership and disaster management team.

Second, ED and non-ED nurses both reported lower levels of preparedness regarding recovery state education, which would include recognizing PTSD. This was also not explored in other studies, but one reason for lower levels of preparedness about the recovery state might be an overall lack of education in both nursing programs and in the facility. Lim, Lim, and Vasu (2013) surveyed HCWs from different units and facilities and found that less than 20% had participated in training within the previous two years and less than one third knew how to access training. This demonstrates that a lack of education is a global concern. Another explanation might be that there is a specific lack of education regarding PTSD. While it is clear that nurses

are not prepared to address issues such as PTSD post-disaster, they do not appear to focus on this area for future education. Mitchell et al. (2012) discussed six key topics nurses identified for future training, none of which involved long-term post-disaster issues, such as PTSD.

Aim 3

The purpose of Aim 3 was to examine the association between individual, unit, and organizational characteristics associated with disaster preparedness among nurses in the pediatric hospital.

Disaster Preparedness

In this study, two independent variables (prior disaster experience and previous disaster education) were not predictors of disaster preparedness. The only significant predictor was unit type. Other researchers have not explored the ability of unit type, prior disaster experience, or previous education to predict disaster preparedness. This finding was somewhat unexpected, as it was anticipated that all three independent variables would influence disaster preparedness because previous research found a positive correlation between prior disaster experience and confidence in disaster management and a positive influence between previous disaster education and disaster preparedness attitudes (Ahayalimudin & Osman, 2016). However, this study did not include a regression analysis, and therefore it is difficult to state which variables may have influenced each other. In addition, confidence in disaster management and the disaster preparedness dependent variable in this study were looking at slightly different variables. One reason for these findings might be that the scope of topics covered by the disaster preparedness questions would likely not have been covered in academic or workplace education. For example, several of the questions addressed personal preparedness plans. Brice et al. (2017) found that less

than half of the HCWs surveyed were personally prepared for a disaster and approximately one third had a complete family disaster plan.

Secondly, those with prior disaster participation may not have had experience with all the topics in the survey questions. Li et al. (2015) found that Chinese nurses responding to an earthquake did not have the necessary skills to respond and were not prepared. In addition, they did not have follow-up psychological care. Several of the questions addressed disaster response at the local and state levels. It is possible that participants may have felt the community was prepared and discovered during their response, that the community was actually unprepared for such an event. This might potentially decrease feelings of preparedness after participation in the disaster. However, this has not been directly studied. Due to the significant differences found in Aim 2 regarding ED and non-ED nurses, it was expected that unit type would be a predictor of disaster preparedness.

While previous education was not a significant predictor, at least half of the participants expressed a desire for further education on various topics listed, which is in agreement with Li et al. (2015), who found that participants believed that disaster education should be incorporated into nursing programs, in addition to being available to currently practicing nurses. Both studies indicated that nurses have a desire for more disaster-related education. In addition, Ahayalimudin and Osman (2016) found that education and training were associated with higher levels of disaster readiness, which is supported by the findings of the present study.

Response Abilities

All three independent variables (participation in a real disaster, unit type, and disaster education) were statistically significant predictors of response abilities. Again, researchers have not conducted regression studies exploring response abilities. One reason that prior disaster

experience might predict response abilities is that many of the survey questions addressing response abilities included topics such as describing one's role in the response phase of the disaster, confidence in providing care and executing emergency procedures, and recognizing potential exposure to biological weapons. Lim, Lim, and Vasu (2013) found that HCWs at hospitals who had experienced SARS and H1N1 outbreaks were more confident in their facilities' disaster response than those who had not experienced these pandemics. Those with prior disaster experience would be more familiar with the role of a nurse in disaster response and executing emergency procedures, as these are likely duties they performed during their disaster experience. This is supported by the findings of Baack and Alfred (2013), who reported that nurses with experience in a disaster or working in a shelter post-disaster were more confident regarding preparedness. These findings are relevant for the response phase.

One reason that unit type may be a significant predictor of response abilities is because ED nurses typically participate in more drills and training, as was found in this study (Hodge, Miller, & Skaggs, 2017). Increased exposure to drills and education would likely increase levels of preparedness (Ahayalimudin and Osman, 2016; Arbon et al., 2013). Previous disaster education might be a significant predictor of response abilities because education and training often includes biological agents and an overview of the different groups of biological weapons. This is supported by Becker and Middleton (2008) who found that nurses had received some training for CBRNE events. However, there was a lack of education regarding radiological emergencies.

Recovery Preparedness

Disaster education was a significant predictor of recovery preparedness, while unit type and prior disaster experience were not predictors. Other researchers have not explored the

predictive relationship between these variables. One possible explanation for these findings might be that recovery preparedness survey questions focused mainly on the care of people post-disaster and recognizing signs and symptoms of PTSD. These may be more likely to be covered in a nursing program, and most of the hospital drills typically do not include care post-disaster or mental health concerns. Weiss et al. (2019) found that inpatient nurses desired more education on recognizing post-traumatic stress in children, implying that they were not receiving on-the-job training regarding symptom recognition. This also might be why unit type was not a predictor of recovery preparedness. The ED may have more drills, but topics such as PTSD are not included. Because of this, the ED would not have an advantage in recovery preparedness. This was supported by the results of this study, where there was not a significant difference between ED and non-ED nurses regarding recovery state education.

A reason that previous disaster experience may not have been a predictor of recovery preparedness is that if those with experience were mainly involved in a hospital response, it is unlikely that many of them were exposed to mental health evaluations. While Li et al. (2015) focused on the mental health of providers, they found that there was little follow-up psychological care for nurses. This demonstrates an overall lack of mental health education and training.

Overall Preparedness

Participation in a real disaster, unit type, and disaster education were statistically significant predictors of overall preparedness. This is in agreement with the findings of Arbon et al. (2013), who found previous disaster experience to be positively correlated with overall feelings of preparedness, and Baack and Alfred (2013), who reported higher levels of perceived confidence in those with previous disaster experience. While these studies did not look at the

predictive ability of the independent variables, the findings indicate similar results to the present study.

King et al. (2019) used the DPET for American military healthcare personnel and found participation in drills and participation in a real disaster were predictors of higher scores. However, training for military personnel is very different from the training that nurses at nonmilitary hospitals receive. In addition, the outcome measured in the study was stated as higher scores on the DPET, but it was not clear if these scores were an overall mean or for certain subsets of the tool (such as the dependent variables used in the present study). The independent variables in the present study were not significant predictors for all of the dependent variables, but one reason they were all predictors of overall preparedness might be that overall preparedness includes a more comprehensive assessment of disaster preparedness than the other dependent variables. Therefore, when looking at preparedness in a broader sense, it is reasonable to believe that all of the independent variables would be significant predictors. The few other studies using the DPET did not use the same dependent variables, and the priority was to validate the translation of the tool, and therefore they did not explore the differences between the categories of questions and overall preparedness.

Implications of Findings

This study was the first to use the DPET with American pediatric nurses, and has implications for theory development, practice, leadership, and policy.

Theoretical Implications

Many disaster studies are not grounded in theory, and there is much room for improvement in theory-based disaster nursing research. Currently, disaster-specific nursing theories do not exist. Nursing researchers have the opportunity to apply current nursing theories

to disasters or to develop new theories. Several nursing models were identified in a review (Pourvakhshoori, Norouzi, Ahmadi, Hosseini, & Khankeh, 2017) and included a health management model, returning to one's community after a disaster, a disaster-related nursing curriculum, a military model, and a model regarding ethical decision-making. Some of these models were initially explored as early as 2004, but have yet to be developed into full nursing theories, or applied in other studies. These models could be further investigated and developed into sound nursing theories that might guide future disaster-related nursing research.

Self-efficacy has been studied in the context of disasters, but no studies were located which described using the Theory of Self-Efficacy to frame the studies. None of the reviewed studies included a theoretical foundation for disaster research. On a broader scale, this shows a lack of theory-based research in both nursing and non-nursing inquiries. It is vital that future disaster nursing studies include a theoretical foundation to strengthen research findings and theoretical knowledge. Progress might start with qualitative studies to develop a disaster nursing theory. The field of nursing might also benefit from the development of a disaster-specific theory. There has been an increase in disaster-related nursing publications, but none have yet to explore theory development. There is a great opportunity for nurses to change this and positively influence the future of disaster nursing research.

The DPET has been used in several prior studies. However, none of the studies exclusively surveyed American pediatric nurses. This provides many opportunities for future research, to aid in verification of this study's results or propose new ideas. It is clear from the findings of all studies using the DPET that nurses around the world are unprepared for disasters. The DPET can be used to identify existing gaps so they can be addressed in future training and educational opportunities. Among the studies that have used the DPET (Tichy et al., 2009; Al-

Khalaihel et al., 2010; Chen et al., 2014; King et al., 2019), there was no consistency in the type of participants, variables, or outcome measures, making comparisons difficult. The DPET should continue to be used to help build a body of disaster-related nursing research.

The four hypotheses in this study were developed from the Theory of Self-Efficacy. The concept of self-efficacy has been studied, in limited ways, in disaster research. However, studies exploring self-efficacy did not conceptualize the theory as in this study. Moreover, other studies did not include thorough discussion of the theory or how the theoretical concepts were applied to research methods or analysis. More studies should be conducted using the conceptual model presented, to support the application of the Theory of Self-Efficacy to disaster nursing research.

Hypothesis 1 was based on performance accomplishment and investigated the association between previous disaster experience and preparedness, but findings indicated no differences in any of the dependent variables based on previous experience. For future research, other studies might be conducted using the DPET to see if similar results were obtained. In addition, researchers might explore a different method of assessing or defining previous disaster experience.

Hypothesis 2 was based on emotional arousal and explored the association between unit type and preparedness, with ED nurses demonstrating statistically significant higher levels of preparedness than non-ED nurses. These findings seem to be consistent with previous research. However, previous studies exploring the impact of unit type did not use the DPET, so subsequent studies might use the tool to compare findings and support or refute the findings of the current study.

Hypothesis 3 was based on vicarious experience and investigated the association between prior disaster education and preparedness. For three of the four dependent variables, there were

statistically significant differences between those with prior education and those without, with those having prior education scoring higher. Future studies might look at other ways to identify previous education or look at specific topics for which nurses had received education.

There were insufficient numbers of nurse managers to test hypothesis 4, which was based on verbal persuasion. Future studies might aim to recruit more managers to test this hypothesis. This study was the first to conceptualize self-efficacy and disaster in this way. More studies need to be conducted using the Theory of Self-Efficacy to explore disaster preparedness. This would help support the application of the theory to different aspects of preparedness.

Practice Implications

Hospital Administration

The findings of this study demonstrate that nurses are underprepared for disasters. Changes in education and practice start with hospital administration. While administrators were not specifically assessed in this study, previous research has indicated that many administrators did not comply with national recommendations for preparedness and made their own decisions regarding staffing (Reilly & Markenson, 2009). Given the overall lack of preparedness found, it is likely that administration is also unprepared and may not have received formal disaster training or education, although this has not been explored in the literature. It is vital that the hospital administration include interdisciplinary staff when planning for disasters.

In addition, successful drills require the support and participation of senior leadership. Without support, drills may not be as successful or well-attended by staff. Also, staff look to leadership to set an example. If the hospital administration is vocal in their support and emphasis on participation, it will have a positive impact on the success of drills (Farra et al., 2017).

When staff believed their administrators would be able to lead effectively in a disaster, they demonstrated increased levels of preparedness (Lim et al., 2013). This study did not address specific qualities of administration that would increase staff confidence, but this might be explored in future studies.

Previous research also demonstrates that hospital leadership is not prepared for disasters. Hoying et al. (2017) developed a training program for hospital leadership, and demonstrated a positive outcome, with the desire to expand education to other staff. A model like this might be used at the study facility. All staff (clinical and non-clinical) need to receive education, but a structured program with a consistent message, starting with the training of senior leadership, might be very beneficial.

Nursing Leadership

Another concern with training is the chronic understaffing faced by many facilities that nurse leaders encounter. While not assessed in this study, staffing is a known barrier to training and education and this study indicated that nurses were not well-prepared, and that more training and education is essential. One way to assist training opportunities is to have adequate staffing, which is influenced by nursing leadership. In the presence of staffing shortages, managers did not send staff for training or participation in drills (Goodhue et al., 2013; Reilly & Markenson, 2009). One recommendation for the nursing leadership at this facility would be to maintain adequate baseline staffing so nurses have the ability to participate in drills and are encouraged to seek out additional educational opportunities. Also, if nursing leadership was committed to sending staff for training, it might influence the development of education programs at the facility. Another potential solution to this issue would be to have more drills on individual units.

These may not be as beneficial to a hospital-wide response, but would give more staff an opportunity to be involved and become more familiar with disaster plans at the facility.

Nursing leadership is also important in the trust staff has in their facility. Higher levels of distrust led to less nurses reporting a willingness to respond in a disaster (Arbon et al. 2013). One area that led to distrust was poor communication and training regarding facility disaster plans. This issue might be addressed by nursing leadership, ensuring that nurses receive periodic training and that communication plans are in place for disaster.

The overall results of the study indicate that nurses at the facility had a moderate level of preparedness, but there is much room for improvement. At least half of the participants indicated an interest in receiving disaster-related education on the topics listed. The results of this study might lead to educational changes in the institution. Material might be developed and presented to staff that focus on major gaps identified in the findings. Standardized education might be provided to all staff at the facility, with unit-specific training at other times. Additional disaster education might also be offered quarterly, either in a classroom environment or via online modules. There are also many free online courses through FEMA and other organizations, which would provide staff with an opportunity to increase their knowledge. However, it is suspected that most staff are probably not aware of these resources or how to access them. Providing a list to staff of available training both online and in the community might be very beneficial.

Registered Nurse

It was clear from this study's findings that ED nurses had more opportunities to participate in drills and continuing education than non-ED nurses. As previously mentioned, the facility has recently started to include inpatient units in large scale drills. This practice is encouraged and is in line with growing trends around the country and recommended in the

literature. While large-scale drills involving the entire facility typically occur once per year (the other required exercises are typically tabletop drills or on a smaller scale), units can conduct drills on their own.

The ED has a decontamination drill every year, where staff sets up the showers in the ambulance bay, and practices with PPE. These drills are beneficial but there is much room for improvement. As mentioned in the literature, it is recommended that non-clinical staff train in decontamination procedures so they are able to perform those tasks in the case of a disaster, allowing the ED to assume patient care responsibilities (Timm & Reeves, 2007). The facility is currently recruiting non-clinical staff for a decontamination team, which would require yearly training and provide an incentive. In addition, these decontamination drills are not mandatory requirements for staff. In future years, it would be beneficial to include these drills as part of mandatory education days.

The OR has recently sought out disaster education and is working to revise policies. This was a direct result of participating in a hospital-wide drill and recognizing the need for improvement. Other inpatient units should be encouraged to explore their unit-specific plans and practice with staff. Hospital staff were aware of the presence of a plan, but it is unclear how many are truly familiar with their expected roles and responsibilities. All units might require mandatory yearly education on their specific policies and conduct small scale drills or tabletops. The hospital might develop a disaster-related education program yearly for staff and address some of the gaps identified in the study. In addition, staff might be notified of more opportunities for community involvement and encouraged to participate.

Many staff (mean score was 2.54) were not aware of classes about disaster preparedness and management that were available, which is consistent with the findings of Lim et al. (2013),

but desired this information (Hodge et al., 2017). There are several opportunities for improvement. First, staff might be more proactive in seeking opportunities. Second, coworkers and management should be supportive and encourage staff to attend training and education, as well as update staff on available options.

There are many opportunities in the community for both medical and non-medical residents. Often these opportunities are not well-publicized. The findings of the study indicated that most participants were not involved in planning or response efforts in their communities, while some expressed a desire to improve their understanding of local resources and ways to get involved. Engaging staff and distributing information about available resources and opportunities may increase the likelihood of nurses taking a more active role in disaster planning and response in their communities.

Policy Implications

The findings of this study indicate an opportunity for policy improvement at the hospital, local, state, and national levels, as well as implications for education requirements. As previously discussed, the hospital requires participation in drills, but the majority of staff is not required to attend. There might be changes implemented in unit-level policy requiring nurses to participate in one drill every year, whether it be on the unit or for a hospital-wide exercise. Educators might include disaster education in their yearly education days. In addition, online and classroom learning might be better publicized to help interested staff obtain more education.

Hospital

At the hospital level, exercises should continue to increase the inclusion of non-ED units. Over the past several years, drills at the facility of study have gradually included more units, but there is still room for improvement, both with inpatient nursing units and non-clinical areas.

There may need to be greater incentive programs to help increase the number of non-clinical staff on the decontamination teams. The team has not begun official training, as they are still trying to recruit more members. Further research might be done to determine how other facilities have been successful in recruiting non-clinical employees for the decontamination team.

The hospital might also conduct more drills than is required by federal guidelines. This may be difficult, as drills take extensive planning, especially if they involve multiple units in the hospital, and do affect the hospital (additional signage, increased usage of elevators to transport “patients”). However, this is one area where unit-specific drills could also be helpful, as they would involve less resources.

In addition, the hospital is affiliated with a local nursing school and medical school. Hospital administration could collaborate with these institutions to develop policies regarding joint training and education, as well as for interdisciplinary opportunities. Local hospitals could also form a network that was dedicated to improving preparedness in the region, which could be accomplished via policies requiring interfacility cooperation for drills and other training.

The facility of study is connected to an adult hospital. However, these institutions typically do not collaborate for drills. There is a great opportunity for these facilities to work together, as a large-scale disaster would likely involve pediatric and adult patients arriving at both hospitals. The disaster managers and hospital administrators could work together to establish guidelines and conduct joint drills.

Local and State

At the local and state levels, nurses can help advocate for the inclusion of more pediatric requirements in disaster drills, as well as increased guidelines for the drills. Currently, the

guidelines for required annual drills are vague, and facilities have flexibility with the type and scope of drills they conduct. This may be more convenient for healthcare institutions, but it may not be the best approach for disaster preparedness. Nurses know first-hand the importance of being prepared for the unexpected and recognize the toll that even normal seasonal fluctuations in admissions takes on the hospital and staff. They can help advocate for adequate training and preparedness with their legislators.

This study specifically addressed disaster preparedness through a pediatric lens. Therefore, all of the drills at the study facility include pediatrics and the hospital has appropriate pediatric supplies. However, many adult or adult/pediatric centers do not focus on pediatrics in their planning, which is in conflict with the recommendations of Burke et al. (2010), which included a suggestion that 15-20% of patients in a drill should be pediatric.

The facility is seen as a leader in pediatric health care. The nurses at this hospital can help advocate for the inclusion of more pediatric-specific disaster preparedness at other facilities. Many governmental and independent studies have made suggestions about pediatric preparedness, but none of them have been adapted into law or developed into official guidelines. The pediatric nurses could serve as leaders to help advocate for policy changes that mandate a minimum level of pediatric disaster readiness.

National

There are no national guidelines for educational requirements regarding disaster preparedness. Nurses might help lobby to require a certain number of hours included in nursing programs. More studies would need to be conducted on the best approach. Disaster preparedness experts could also be consulted to help determine the best/most appropriate topics to cover in nursing school, as well as calculate an approximate number of hours that would be sufficient for

such training. The findings of this study indicated that most nurses did not feel comfortable assessing patients with PTSD and other long-term issues after disaster. Nursing programs would be an opportune time to include this information. In addition, schools might provide education on disaster basics, and general triage principles. Even though all nurses would not be conducting triage in a disaster, it is important for them to understand the tenets of disaster triage. There might be specific national guidelines developed for a dedicated number of hours to disaster education, with required content. In addition, Joint Commission or other healthcare bodies might support required annual education for staff.

Further research could help indicate whether regional-specific training (for example, covering earthquakes in California nursing programs, while focusing on tornados and earthquakes in the Midwest) would be advantageous. It might be more beneficial and increase the likelihood of policy approval if there are standardized objectives that nursing schools would be required to meet. However, previous studies have not explored these issues. National policy guidelines would have a greater impact than those at the state level, as it would ensure that all nurses are receiving consistent information. In addition, nurses may relocate for school and/or jobs, and it could be very beneficial for everyone to have the same educational foundation. This would allow facilities to focus more on regional education, with annual competencies for basic disaster topics covered in school.

Limitations of the Study

This study had several notable limitations. First, this study was conducted at a single pediatric center, limiting the generalizability of results. Other pediatric and adult facilities, both in the same city and around the country, may have different results. This might partly be due to geographical variations and the type and frequency of disasters around the country. However, for

this institution, the results of the study are valuable. The facility can use the results to help improve preparedness, as the gaps identified in the study can serve as a foundation for additional training and education, with additional topics and exercises added over time. In addition, the study serves as a foundation for more research at similar facilities, eventually expanding to hospitals across the country. If the study can be repeated at similar institutions nationwide, it might help lead to improvements in disaster preparedness on a large scale.

Second, while an adequate number of participants was obtained for the study, not all of the units had the same proportion of participants. The ED had the highest percentage of participation, which is likely due to the researcher working in the ED. It is difficult to know how this affected results. In the future, recruitment efforts might focus on a minimum participation percentage from each unit. Another reason for the higher levels of ED participation might also be a reflection of the study results. If ED nurses have more experience with disasters, they may have more interest in disaster-related research than non-ED nurses, although this was not assessed. Therefore, it is possible that if the study were conducted at a different institution where the researcher was not employed, a higher percentage of ED participants may still exist. Despite this limitation, the study is a good foundation of assessing preparedness at the facility. The differences between ED and non-ED nurses were anticipated and in agreement with previous research. The study was able to identify gaps in ED and non-ED preparedness and serves as a solid foundation for future research. In addition, 15 of the participants primarily worked in the float pool. These nurses are trained in the ICUs, ED, and inpatient units. Because of this, some of their required training is similar to the ED nurses. There were not enough participants from each unit to break down for further analysis, but it is possible that the float pool nurses (counted in the non-ED group), could have positively skewed the scores in that group. However, it is difficult to

determine what unit-based training had the most significant impact on their scores. Nevertheless, it is important to include this group of nurses in analysis, as they would be highly utilized in a disaster given their diverse training.

Third, one hypothesis was unable to be tested because there were not enough nurse managers who responded. There was an interest in the influence of job description on preparedness, although it is unknown whether the hypothesis would have been supported, as this was not directly assessed in other studies. In the future, a better recruitment approach may involve contacting unit managers, instead of educators, which might potentially help increase manager participation. An increase in manager participation might also help set an example for staff participation. Although the hypothesis was not tested, the managers' responses were still important to the overall study results.

Fourth, survey questions addressed prior education and training, but there were not specific questions on the type or quantity of education or training. Prior education was determined by undergraduate education. All of the nurses did not complete an undergraduate degree, although the majority had. It is unknown how many associate's programs offer disaster training. As there is a lack of national guidelines, it is difficult to know the type and quantity of education and training nursing students received. Questions might have been added or a qualitative approach might be used to obtain this information. Although details about education and training were not available, the data can still be used to develop future training for staff, both at the facility and in nursing programs. While it is hard to assess specific education gaps, it is clear from the results, that there is a need for disaster education in nursing programs. In addition, the results still provide a foundation for future research into curriculum development and facility training.

Fifth, this study was a self-assessment of disaster preparedness. Therefore, there is always the potential that staff over- or under-estimated their knowledge. This might make it difficult to assess potential knowledge gaps. However, staff might have the knowledge, but still may not feel comfortable assessing signs and symptoms of exposure to biological agents. In this way, a self-assessment might be more valuable because if staff are not confident in their abilities, it might affect their performance in a disaster. An additional survey with content-based questions might also be used to assess preparedness. Again, however, a self-assessment might actually be more valuable in some respects, as nurses with training may indicate they still do not feel prepared, providing an opportunity for additional education and reinforcement.

Lastly, this was the first study to use the DPET with American pediatric nurses. Therefore, it was difficult to compare results with other studies. However, this provides a foundation for other facilities to conduct similar research using the DPET to aid in developing a sound body of research surrounding disaster preparedness. Also, the more the tool is used, the more researchers will become familiar with it, which may increase its usage. Research starts with a single study, and develops over time. The results of this study can help inspire future investigations.

Despite the fact that few studies have used the DPET or explored the disaster-related experiences of nurses, this study can provide the groundwork for a new body of literature. Results clearly indicate that nurses are not well-prepared and desire more knowledge and training. It is our responsibility to use the findings from this study to implement change at the research facility. Continued assessment of other hospitals using the DPET can help to identify common gaps and new standardized programs and training might be developed, with individual facilities ensuring beneficial drills take place.

Suggestions for Future Research

Based on the findings of this study, the following suggestions for future research are posed. First, little research has been conducted on self-efficacy and disaster preparedness. Future studies might investigate the influence of self-efficacy on preparedness. Kiliç & Şimşek (2019) demonstrated the positive impact on disaster preparedness and self-efficacy among nursing students who received training in psychological first aid. The present study did not evaluate self-efficacy, but in the future, researchers may want to use the DPET and a self-efficacy scale to further evaluate this relationship and support or refute the limited findings that have been reported in the literature. Several other studies have explored the development and/or use of several disaster-related self-efficacy scales (Johnson-Toro, 2017; Li, Bi, & Zhong, 2017). However, these tools have been applied on a limited basis, and require further testing with different populations, as these studies did not include inpatient hospital or ED nurses. Despite limited use thus far, the tools serve as a basis for further research and application of the Theory of Self-Efficacy.

One area that has yet to be explored is self-efficacy in the context of decontamination. This could be investigated for both nursing staff and other non-clinical employees who are members of the decontamination team. Results could be used to help provide better training for both clinical and non-clinical staff.

If new education and training were developed, self-efficacy might be evaluated pre- and post-intervention to help measure the effectiveness of new programs. If significant differences were found, the program could be piloted and then potentially used in other institutions. After education programs are put in place at the facility of study, the DPET might be administered at a

future date to compare findings. It is also important to include multiple units at the hospital to identify gaps that might be addressed within the facility.

This study was the first to conceptualize disaster preparedness using the DPET in the context of the Theory of Self-Efficacy. Additional research might help to better frame the theory to apply to disaster preparedness and help gain a better understanding of the relationship between self-efficacy and disaster preparedness. Future research might help to confirm the application of the theory as was done in this study, or might lead to a new direction. Studies should be replicated to aid in validating new theories and conceptual application of existing theories. Li et al. (2017) mentioned the Theory of Self-Efficacy in the development of their disaster-related self-efficacy tool. However, the tool was developed for nursing students and there is a lack a discussion in how the theory guided tool development.

Second, this was the first study to use the DPET for American pediatric nurses. Therefore, there is a need for further research using the DPET to assess the disaster preparedness of nurses. The tool has been translated into other languages and used with nurses in several other countries. However, this can make the evaluation of study findings difficult, as there are many differences in healthcare practices around the world. More studies need to be conducted in the US to help support or refute study findings. In addition, this study was at one hospital with pediatric nurses. The only other studies conducted in the US included the development of the tool with a group of nurse practitioners (Tichy et al., 2009) and a military study conducted with an interdisciplinary group of health professionals preparing for deployment (King et al., 2019). These two populations are very different from the participants in the present study. More research with all of these groups could help identify similarities and differences and guide future training and educational opportunities.

Third, the DPET might be used at other facilities to see if similar results are found. The DPET had not been used with pediatric nurses prior to this study. Additional research might start at other urban level 1 pediatric trauma centers, or might focus on both pediatric and adult facilities in the same city where the study took place. Future studies should be sure to include staff from various departments. In addition, research should include more hospitals (including pediatric, adult/pediatric, and adult institutions) spanning a larger geographical region. It might be very beneficial to compare pediatric preparedness among those groups of institutions. Gaps could be identified to help improve pediatric disaster preparedness across the country. The hope is that if future studies are able to recruit more participants, the unit type might be broken down further into groups such as ICUs, OR, and inpatient floors. This might provide more information and a better focus for interventions in various areas and room for improvement in preparedness, both of staff and the facilities.

Lastly, future research might also help to develop educational programs that might be used at hospitals and in nursing programs. By identifying gaps on a larger scale, programs might be developed focusing on these specific areas. A standardized approach to disaster education in nursing programs might be very beneficial for students. Programs might provide a consistent foundation for nurses, and training that may not be provided on the job. Curriculum for hospitals might be designed by analyzing after action reports from disasters and using the information obtained in disaster-related nursing research. One group looked at the impact of a training program to educate nurses on psychological first aid for victims in Turkey. They found that a structured education program increased nursing students' feelings of preparedness and self-efficacy (Kiliç & Şimşek, 2019). While psychological first aid would address the immediate mental health needs of victims, and not symptoms of PTSD, a training program similar to this could be

employed, as results of this study demonstrated a lack of preparedness regarding mental health concerns. Additional studies would need to be conducted with nurses in the US to see if similar results were obtained and could be used as a foundation for future educational programs.

Conclusions

Overall, nurses in this study were not adequately prepared for disasters. However, ED nurses demonstrated a statistically significant difference compared to non-ED nurses. The ED nurses scored higher on all dependent variables: disaster preparedness, response abilities, recovery preparedness, and overall preparedness. Unit type was a predictor of disaster preparedness, while previous disaster education was a predictor of recovery preparedness. Participation in a real disaster, unit type, and previous disaster education were all predictors of both response abilities and overall preparedness. While several limitations of the study were discussed, the research findings serve as a foundation for interventions starting at the facility, leading to policy implementation at the national level. Nurses have an obligation to ensure their personal preparedness, encourage increased training at their own facilities, and advocate for educational, practice, and policy changes.

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Appendices

Appendix A

Table A1*Recruitment Process using Dillman Technique*

1. Email educators and request distribution of survey to staff.
2. Email educators with link to survey.
3. After one week, send second email to educators with link for survey
4. After an additional week, if necessary, will request to discuss study at nursing huddles and staff meetings, as well as posting flyers in staff lounges
5. One week later, a final email will be sent to the educators

Table A2
Disaster Preparedness Evaluation Tool

Disaster Preparedness

1. I would be interested in educational classes on disaster preparedness that relate specifically to my community situation.
2. I know the limits of my knowledge, skills, and authority to act in disaster situations.
3. I am aware of potential vulnerabilities in my community (earthquake, flood, terror, etc).
4. I find that the research literature on disaster preparedness is understandable.
5. I have a list of contacts in the medical or health community in which I practice. I know referral contacts in case of a disaster situation (health department, etc).
6. I read journal articles related to disaster preparedness.
7. I know where to find relevant research or information related to disaster preparedness and management to fill in gaps in my knowledge.
8. I find that the research literature on disaster preparedness and management is easily accessible.
9. In case of a disaster situation, I think there is sufficient support from local officials on the county or state level.
10. I am familiar with the local emergency response system for disasters.
11. Finding relevant information about disaster preparedness related to my community needs is an obstacle to my level of preparedness.
12. I know whom to contact (chain of command) in disaster situations in my community.
13. I am aware of classes about disaster preparedness and management that are offered in my workplace, university, or community.
14. I participate in one of the following educational activities on a regular basis: continuing education classes, seminars, or conferences dealing with disaster preparedness.
15. I have participated in emergency planning for disaster situations in my community.
16. I participate/have participated in creating new guidelines or emergency plans or in lobbying for improvements on the local or national level.
17. In case of a bioterrorism/biological attack, I know how to use personal protective equipment.
18. I am familiar with accepted triage principles used in disaster situations.
19. In a case of bioterrorism/biological attack, I know how to perform isolation procedures so that I minimize risks for community exposure.
20. I participate in disaster drills or exercises at my workplace (clinic, hospital, etc) on a regular basis.
21. In case of a bioterrorism/biological attack, I know how to execute decontamination procedures.
22. I consider myself prepared for the management of disasters.
23. I would be considered a leadership figure in my community in a disaster situation.
24. I have personal/family emergency plans in place for disaster situations.
25. I have an agreement with loved ones and family members on how to execute our personal/family emergency plans.

Response Abilities

1. I am familiar with psychological interventions, behavioral therapy, cognitive strategies, support groups, and incident debriefing for patients who experience emotional or physical trauma.
2. I am able to describe my role in the response phase of a disaster in the context of my workplace, the general public, media, and personal contacts.
3. Some research has shown that nurses feel constrained by medical malpractice concerns of license restrictions in terms of responding to disasters. This constraint applies to me too.
4. I am familiar with the organizational logistics and roles among local, state, and federal agencies in disaster response situations.
5. I would feel reasonably confident providing patient education on stress and abnormal functioning related to trauma.
6. I can manage common symptoms and reactions of disaster survivors that are of an affective, behavioral, cognitive, or physical nature.
7. I feel reasonably confident I can treat patients independently without supervision of a physician in a disaster situation.
8. I can identify possible indicators of mass exposure evidenced by a clustering of patients with similar symptoms.
9. I would feel confident working as a triage nurse and setting up temporary clinics in disaster situations.
10. As a nurse, I would feel confident as a manager or coordinator of a shelter.
11. As a nurse, I would feel confident in my abilities as a direct care provider and first responder in disaster situations.
12. I would feel reasonably confident implementing emergency plans, evacuation procedures, and similar functions.
13. As a nurse, I would feel reasonably confident in my abilities to be a member of a decontamination team.
14. I feel reasonably confident discerning deviations in health assessments indicating potential exposure to biological agents.
15. I am familiar with the main groups (A, B, C) of biological weapons (anthrax, plague, botulism, smallpox, etc), their signs and symptoms, and effective treatment.
16. In a bioterrorism/biological attack, I would know how to perform a focused health history and assessment specific to bioagents that are used.

Recovery Preparedness

1. I am familiar with what the scope of my nurse role would be in a post-disaster situation.
2. I am able to discern signs and symptoms of acute stress disorder and post-traumatic stress disorder (PTSD).
3. I am comfortable providing education on coping skills and training for patients who experience traumatic situations.
4. I am comfortable managing (treating, evaluating) emotional outcomes for acute stress disorder or PTSD.
5. I am familiar with how to perform focused health assessment for PTSD.
6. I participate in peer evaluation of skills in disaster preparedness and response.

Appendix B

Eight (5.80%) of the participants identified as male, while 103 (74.64%) identified as female, and 27 (19.57%) preferred not to answer (Table B1).

Table B1
Demographic Information

Gender	Count	Percent
Male	8	5.80
Female	103	74.64
Prefer not to answer/did not respond	27	19.57
<i>Total</i>	<i>138</i>	<i>100.0</i>

Eleven (7.97%) participants selected that they were educated about disasters in a graduate nursing program, while 127 (92.03%) did not select it. Eighty-six (62.32%) participants marked that they had been trained in facility drills as an RN, while 52 (37.68%) did not select it. Sixty-eight (49.28%) of participants marked that they have participated or participate in disaster-related continuing education courses, while 70 (50.72%) did not. Ten (7.25%) participants marked that they have participated in a real disaster, while 128 (92.75%) had not.

Two participants stated that they had been involved in mass casualties, 6 listed fires, while two specifically mentioned fires requiring hospital evacuation. One participant was involved in a tornado, one in a bomb drill, one in a commercial bus accident, one in a school bus accident and school gas leak. Thirty-seven (26.81%) participants were formally prepared about what to do in bioterrorism disaster situations, while 101 (73.19%) were not formally prepared. One hundred twenty-three (89.13%) participants were aware that the facility has an established emergency/disaster plan, while one (0.72%) was not aware and 14 (10.14%) were unsure if there was an established plan. Thirty-seven (26.81%) participants felt confident that the emergency plan would be well executed in the case of a disaster, while 45 (32.61%) were not confident, and 56 (40.6%) were unsure.

Thirty-two (23.19%) participants were aware of the level of preparedness of the health care systems in their community, while 63 (45.65%) were not aware, and 43 (31.16%) were unsure. One hundred eighteen (85.51%) participants would like more education about their role as a nurse in disaster situations, while 20 (14.49%) did not select that option. Eighty-nine (64.49%) participants would like more education regarding vulnerabilities in their community, while 49 (35.51%) did not select that option. Seventy-four (53.62%) participants desired more

education on how to respond and assure health promotion, protection, and disease prevention in their community, while 64 (46.38%) did not select that option.

Ninety-seven (70.29%) participants desired more education about biological agents and ways to identify their signs and symptoms, while 41 (29.71%) did not select that option. Eighty-two (59.42%) participants wanted more education about biological agents and their differential diagnosis and treatment, while 56 (40.58%) did not select that option. Seventy-nine (57.25%) participants wanted more education regarding resources in their community, while 59 (42.75%) did not select that option. Seventy (50.72%) participants wanted more education about recovery state and acute stress disorder, post-traumatic stress disorder, and crisis intervention, while 68 (49.28%) did not select that option.

Seventy-eight (56.52%) responded that they did have regular disaster or emergency drills in the workplace, while 60 (43.48%) responded that they did not have regular drills. Fifty-seven (41.30%) participants felt that the regular drills were helpful or effective, while 57 (41.30%) did not feel that they were helpful or effective, and 24 (17.39%) did not answer the question. These numbers are inconsistent with the previous question, where 78 participants responded that they had regular drills. However, in this question, 114 participants responded regarding the effectiveness and helpfulness of drills.

Table B2
Participants Who Selected Answers for Survey Questions

Survey Question	Number	Percent
I was educated about disasters in a graduate nursing program.	11	7.97
I have been trained in facility drills as an RN.	86	62.32
I have participated in/participate in disaster-related continuing education courses.	68	49.28
I have participated in a real disaster.	10	7.25
I was formally prepared about what to do in bioterrorism disaster situations.	37	26.81
I am aware that my workplace has an established emergency (disaster) plan.	123	89.13
I am unsure if my workplace has an established emergency (disaster) plan.	14	10.14
I am not aware of whether my workplace has an established emergency (disaster) plan.	1	0.72
I feel confident that the emergency (disaster) plan in my workplace would be well executed in case of a disaster.	37	26.81
I am not sure if I feel confident that the emergency (disaster) plan in my workplace would be well executed in case of a disaster.	56	40.58
I do not feel confident that the emergency (disaster) plan in my workplace would be well executed in case of a disaster.	45	32.61
I am aware of the level of preparedness of the health care systems in my community.	32	23.19
I am unsure if I am aware of the level of preparedness of the health care systems in my community.	43	31.16
I am unaware of the level of preparedness of the health care systems in my community.	63	45.65

Table B2 continued

Survey Question	Number	Percent
I would like more education about disasters regarding my role as a nurse in disaster situations.	118	85.51
I would like more education about disasters regarding what potential vulnerabilities exist in my community in case of a disaster.	89	64.49
I would like more education about disasters regarding how to respond and assure health promotion, protection, and disease prevention in the community settings such as clinics or doctor's offices in case of disaster.	74	53.62
I would like more education about disasters regarding biological agents and ways to identify their signs and symptoms.	97	70.29
I would like more education about disasters regarding biological agents and their differential diagnosis and treatment.	82	59.42
I would like more education about disasters regarding resources in my community, such as agencies for referral, health departments, emergency contacts, the chain of command, and community shelters.	79	57.25
I would like more education about disasters regarding recovery state: acute stress disorder, post-traumatic stress disorder, and crisis intervention.	70	50.72
We have regular disaster or emergency drills in my workplace.	78	56.52
If we do have regular drills, I feel like they are effective or helpful.	57	41.30
If we do have regular drills, I feel like they are not effective or helpful.	57	41.30

Table B3
Mean Scores for Scaled Questions

Survey Question	Mean	SD	Range
I participate in disaster drills or exercises at my workplace on a regular basis.	3.00	1.45	1-6
I have participated in emergency planning for disaster situations in my community.	2.09	1.38	1-6
I know whom to contact (chain of command) in disaster situations in my community.	2.91	1.47	1-6
I participate in one of the following educational activities on a regular basis: continuing education classes, seminars, or conferences dealing with disaster preparedness.	3.33	1.44	1-6
I read journal articles related to disaster preparedness.	2.16	1.19	1-6
I am aware of classes about disaster preparedness and management that are offered in my workplace, university, or community.	2.54	1.29	1-6
I would be interested in educational classes on disaster preparedness that relate specifically to my community situation.	4.74	0.91	1-6
I find that the research literature on disaster preparedness and management is easily accessible.	3.24	1.11	1-5
I consider myself prepared for the management of disasters.	2.81	1.10	1-5
Finding relevant information about disaster preparedness related to my community needs is an obstacle to my level of preparedness.	3.83	1.00	2-6
I know where to find relevant research or information related to disaster preparedness and management to fill in gaps in my knowledge.	3.19	1.11	1-5
I have a list of contacts in the medical or health community in which I practice. I know referral contacts in case of a disaster situation.	2.59	1.23	1-6

Table B3 continued

Survey Question	Mean	SD	Range
In case of a disaster situation, I think there is sufficient support from local officials on the county or state level.	3.64	1.13	1-6
I participate/have participated in creating new guidelines or emergency plans or in lobbying for improvements on the local or national level.	1.84	1.07	1-6
I would be considered a leadership figure in my community in a disaster situation.	1.80	0.93	1-5
I am aware of potential vulnerabilities in my community.	4.47	1.00	2-6
I know the limits of my knowledge, skills, and authority to act in disaster situations.	4.08	1.04	2-6
In case of a bioterrorism/biological attack, I know how to use personal protective equipment.	3.88	1.30	1-6
In case of a bioterrorism/biological attack, I know how to execute decontamination procedures.	2.92	1.34	1-6
In case of a bioterrorism/biological attack, I know how to perform isolation procedures so that I minimize risks for community exposure.	3.35	1.32	1-5
I am familiar with the local emergency response system for disasters.	3.54	1.12	1-6
I am familiar with accepted triage principles used in disaster situations.	3.74	1.25	1-6
I have personal/family emergency plans in place for disaster situations.	3.16	1.30	1-6
I have an agreement with loved ones and family members on how to execute out personal/family emergency plans.	3.09	1.31	1-6

Table B3 continued

Survey Question	Mean	SD	Range
I am familiar with psychological interventions, behavior therapy, cognitive strategies, support groups, and incident briefing for patients who experience emotional or physical trauma.	3.18	1.25	1-6
I am able to describe my role in the response phase of a disaster in the context of my workplace, the general public, media, and personal contacts.	3.36	1.15	1-5
I am familiar with the main groups of biological weapons, their signs and symptoms, and effective treatment.	2.58	1.16	1-5
I feel reasonably confident discerning deviations in health assessments indicating potential exposure to biological agents.	2.67	1.15	1-5
As a nurse, I would feel confident in my abilities as a direct care provider and first responder in disaster situations.	3.59	1.16	1-6
As a nurse, I would feel confident as a manager or coordinator of a shelter.	2.78	1.23	1-5
As a nurse, I would feel reasonably confident in my abilities to be a member of a decontamination team.	3.21	1.32	1-6
In a bioterrorism/biological attack, I would know how to perform a focused health history and assessment specific to bioagents that are used.	2.78	1.13	1-5
I would feel confident working as a triage nurse and setting up temporary clinics in disaster situations.	3.46	1.36	1-6
Some research has shown that nurses feel constrained by medical malpractice concerns of license restrictions in terms of responding to disasters. This constraint applies to me too.	3.78	1.14	1-6
I am familiar with the organizational logistics and roles among local, state, and federal agencies in disaster response situations.	2.53	1.07	1-6

Table B3 continued

Survey Question	Mean	ED	Range
I would feel reasonably confident implementing emergency plans, evacuation procedures, and similar functions.	3.31	1.14	1-6
I would feel reasonably confident providing patient education on stress and abnormal functioning related to trauma.	3.38	1.20	1-6
I am comfortable providing education on coping skills and training for patients who experience traumatic situations.	3.37	1.29	1-5
I am able to discern signs and symptoms of acute stress disorder and post-traumatic stress disorder.	3.43	1.20	1-6
I am familiar with what the scope of my nurse role would be in a post-disaster situation.	3.15	1.13	1-5
I participate in peer evaluation of skills in disaster preparedness and response.	2.41	1.24	1-6
I am familiar with how to perform focused health assessment for PTSD.	2.67	1.16	1-5
I can manage common symptoms and reactions of disaster survivors that are of an affective, behavioral, cognitive, or physical nature.	3.10	1.17	1-5
I can identify possible indicators of mass exposure evidenced by a clustering of patients with similar symptoms.	3.36	1.21	1-5

Note: Questions were ranked on a scale as follows: strongly disagree (1), disagree (2), somewhat disagree (3), somewhat agree (4), agree (5), and strongly agree (6).

Vita

Erin has been a registered nurse since 2010, spending her career working in pediatrics. She has served as a beside nurse in the Pediatric Intensive Care Unit, Special Care Nursery, and Pediatric Emergency Department. She is currently a Trauma Nurse Coordinator at a pediatric hospital. Erin earned a Bachelor's Degree in Exercise Science from Truman State University in 2009, a Bachelor's of Science in Nursing from Barnes Jewish College Goldfarb School of Nursing in 2010, and a Graduate Certificate in Global Disaster Nursing from the University of Tennessee Knoxville in 2015. She currently serves on several hospital-wide committees, including the Emergency Management Team. She is a member of the Society of Trauma Nurses, Pediatric Trauma Society, Emergency Nurses Association, and the World Association for Disaster and Emergency Medicine. Erin has presented group research at an international conference and has had several poster presentations. She has volunteered with Operation Smile and ProPAPA Missions Honduras.