

# Disaster preparedness among nurses: a systematic review of literature

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**Aim:** This review explored peer-reviewed publications that measure nurses' preparedness for disaster response.

**Background:** The increasing frequency of disasters worldwide necessitates nurses to adequately prepare to respond to disasters to mitigate the negative consequences of the event on the affected population. Despite growing initiatives to prepare nurses for any disasters, evidence suggests they are under prepared for disaster response.

**Methods:** This is a systematic review of scientific articles conducted from 2006 to 2016 on nurses' preparedness for disasters. SCOPUS, MEDLINE, PubMed, CINAHL and PsychINFO were the primary databases utilized for search of literature. Keywords used in this review were as follows: 'emergency', 'disaster', 'disaster preparedness', 'disaster competencies', 'disaster nursing', 'disaster role' and 'nurse'. Seventeen (17) articles were selected for this review.

**Findings:** Factors that increase preparedness for disaster response include previous disaster response experience and disaster-related training. However, it is widely reported that nurses are insufficiently prepared and do not feel confident responding effectively to disasters.

**Conclusion:** The findings of this review contribute to a growing body of knowledge regarding disaster preparedness in nurses and have implications for academia, hospital administration and nursing educators. The findings of this review provide evidence that could be used by nurse educators and nurse administrators to better prepare nurses for disaster response.

**Implications for nursing and health policy:** The findings from this review place an emphasis on hospitals to implement policies to address lack of preparedness among their employees. Furthermore, this review highlights the benefit of further research and provision of well-grounded disaster exercises that mimic actual events to enhance the preparedness of the nursing workforce.

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## Background

It has been widely reported that nurses worldwide play a significant role in the response to disasters and have done so since the earliest days of the profession (Turale 2014; Veenema 2013). All communities across the world could potentially be threatened by a disaster. In 2015 alone, 99 countries were hit by natural disasters resulting in the displacement of millions of people, more than 22 000 deaths and 70.3 billion USD (United States Dollar) worth of damage (Guha-Sapir et al. 2015). Furthermore, these figures represent an upward trend in disasters (Guha-Sapir et al. 2015). Given the frequency with which disasters occur and the effect they have, nurses' preparedness to respond to these events is of critical importance in reducing the negative consequences to the health of the affected population.

A formal definition of a disaster has not been agreed upon by all groups at this point in time (Mayner & Arbon 2015; WHO & ICN 2009), but the World Health Organization (WHO) draws on definitions from the International Strategy for Disaster Risk Reduction (ISDR) and the Centre for Research on the Epidemiology of Disaster (CRED). The definition relates to an incident or incidents which may involve a significant number of individuals or groups of individuals, including a community or even a country where there is a development of an event or events that may affect the health, economy or environment negatively. The overall effects of the disaster may involve the need for local or even national or international assistance to provide interventions for those affected (CRED, 2009).

Common to these definitions is a disaster's impact on humanity and the ability to overwhelm existing resources. The effect that disasters have on the health status of a community implicates the nursing profession, who as the largest healthcare workforce group are likely to be involved in caring of people affected by disasters (Perron et al. 2010; WHO, 2009).

The critical role of nurses during disasters is emphasized in health policy aimed at adequately preparing nurses for disaster response locally and internationally. Most notably, a framework of Disaster Nursing Competencies published by the International Council of Nurses (ICN) in 2009 outlines 10 competency domains for nurses responding to disasters (ICN 2009). In their review of literature related to disaster competencies for healthcare providers, including nurses, Daily et al. (2010) found that hundreds of competencies have been developed but that terminology and structure are inconsistent

and imprecise. Furthermore, universal acceptance is lacking and none of the competencies have been validated (Daily et al. 2010).

There has been an increasing focus on disaster preparedness of nurses in the literature in recent years (Chapman & Arbon 2008; Fox & Timm 2008; Labrague et al. 2016; Mayumi et al. 2009). In fact, it has been reported that disaster preparedness has been integrated into nursing curriculum with a focus on principles and management of patients in an event of a disaster (Labrague et al. 2016; Mayumi et al. 2009). Local and international initiatives are in place to adequately prepare nurses and other healthcare workers to respond effectively to disasters through extensive disaster training, disaster drills and exercises, and the provision of disaster management courses with the expectation that nurses should be able to deliver adequate nursing care to the communities affected by disasters (Corrigan & Samrasinghe 2012; Ibrahim 2014; Perron et al. 2010; World Health Organization (WHO) 2009). In spite of these initiatives, available evidence has shown that nurses remain inadequately prepared to respond to disasters and are uncertain of their roles during these events (Duong 2009; Melnikov et al. 2014; Usher et al. 2015). A comprehensive review of the current state of disaster preparedness among nurses is essential to enhance preparedness for disaster events.

## Methods

### Aim

This systematic review explored peer-reviewed publications that measure nurses' preparedness for disaster response.

### Search strategy

A search of electronic databases was conducted to identify relevant studies. The primary databases utilized for search of literature were SCOPUS, MEDLINE, PubMed, CINAHL and PsychINFO. Keywords included the following: 'emergency', 'disaster', 'disaster preparedness', 'disaster competencies', 'disaster nursing', 'disaster role' and 'nurse'.

### Inclusion and exclusion criteria

Articles were considered for review if the objective of the research was to measure disaster preparedness in nurses. Furthermore, articles were included for review if they met the following criteria: (1) peer-reviewed, (2) published in English language and (3) published between 2006 and 2016. Articles

that did not attempt to measure preparedness of nurses were excluded from review. Articles that included nurses as part of a sample with other professionals were also excluded from review, as were articles that measured preparedness for experiences other than disaster response.

### Search outcomes

The initial search resulted in 332 papers. This number diminished to 60 after a review of titles and abstracts found that 272 articles had no relevance to the objectives of the review. A full text reading of the remaining articles resulted in seventeen (17) studies that were considered appropriate for review. The process followed to identify relevant articles for the review is demonstrated in Fig. 1.

### Quality appraisal and data synthesis

Quality of the articles was examined using the appraisal checklist for quantitative studies by Kmet et al. (2004). The checklist is one of the most often used tools to appraise the methodological quality of quantitative papers. The checklist contains ten (10) components in which a score of 0–2 is assigned. In this review, the quality score ranged from 80% to 100% out of a possible score of 100%.

Due to variety of scales used, diversity of samples and variances in the data collection method, meta-analysis of data was not possible. Hence, analyses of data extracted were conducted following a thematic analysis technique (Center for Reviews and Dissemination, 2008). Data extraction was performed by the researchers. Data extracted from studies included the following: authors/year, country, samples/sampling technique, research design, research aim, instrumentation and findings.

### Results

Findings of this review are reported based on: (1) methodology, (2) reported level of disaster preparedness in nurses, (3) previous disaster response experience, (4) the role of disaster training or courses, (5) awareness and execution of workplace disaster plans and (6) strategies to enhance disaster preparedness. A summary of articles for review can be found in Table 1.

### Methodology

The majority of studies ( $n = 5$ ) were conducted in the United States (US; Baack & Alfred 2013; Goodhue et al. 2012; Hodge et al. 2015; Jacobson et al. 2010; Whetzel et al. 2013). The

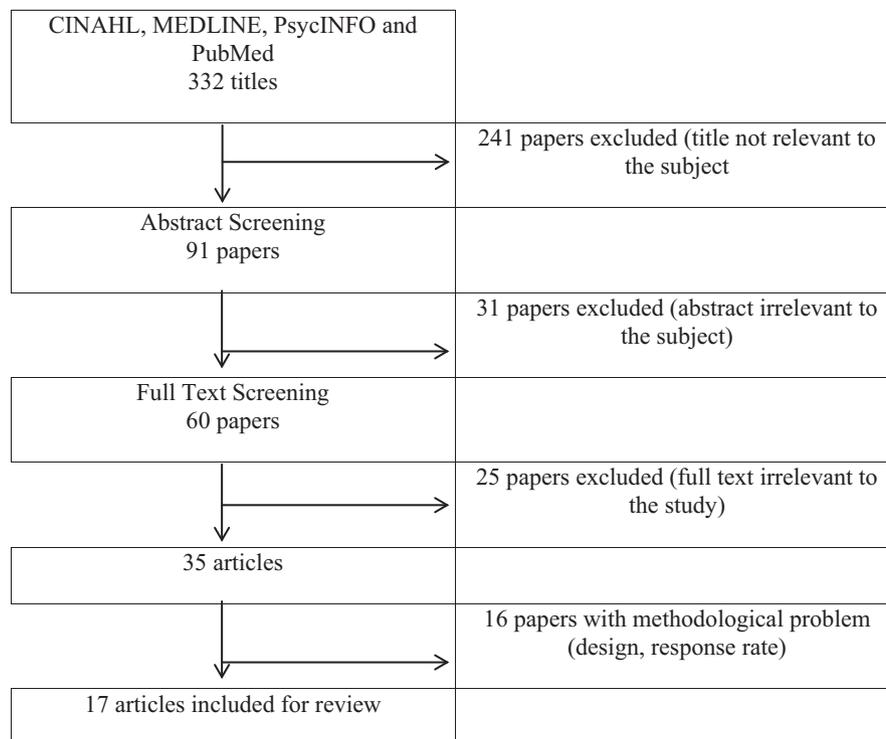


Fig. 1 Flow diagram of the process used to identify references for the systematic review.

Table 1 Quantitative studies on disaster preparedness in nurses

Author	Settings	Samples	Sampling Method	Research Purpose	Research Design	Instrument	Major Findings
Baack & Alfred (2013)	USA	620 nurses	Convenience sampling Sampling size determined	To describe current status of nurses preparedness to manage disasters	Descriptive correlational	Emergency Preparedness Information Questionnaire (EPIQ) (Garbutt et al., 2008) Cronbach's alpha 0.97 Nurses Assessment Readiness (NAR) (Baack & Alfred (2013) Cronbach's alpha 0.90 Job Satisfaction Questionnaire (Wieck et al., 2009) Cronbach's alpha 0.85 Research-made questionnaire. Questions were based on literature review	<ul style="list-style-type: none"> <li>Perceived competence with regards to disasters was considered low.</li> <li>Nurses were not fully prepared to respond effectively with disasters</li> </ul>
Duong (2009)	Australia	152 nurses	Convenience Sampling	To explore emergency nurses' perceptions of their disaster knowledge and experience	Descriptive Study		<ul style="list-style-type: none"> <li>Nearly half (45%) of nurses perceived themselves to have low level of disaster preparedness.</li> <li>Less than a quarter (19%) of nurses felt confident with their own level of disaster preparedness</li> </ul>
Hodge et al. (2015)	USA	307 nurses	Convenience Sampling	To evaluate nurses' self-perception of emergency preparedness at a rural hospital in southeast Ohio	Descriptive Study	Emergency Preparedness Information Questionnaire (EPIQ) (Garbutt et al., 2008) Cronbach's alpha 0.972 Nurses Assessment Readiness (NAR) (Baack & Alfred (2013) Cronbach's alpha 0.92	<ul style="list-style-type: none"> <li>Nearly half (44.6%) of the respondents rated themselves as less prepared for disasters.</li> <li>Nurses' age and experience increased preparedness for disasters in nurses.</li> <li>Emergency nurses had higher level of preparedness than nurses in other units.</li> </ul>
Jacobson et al. (2010)	USA	941	Convenience Sampling	To assess self-emergency readiness and training needs of nurses in rural Texas	Descriptive Study	Research-made questionnaire. Questions were based on literature review	<ul style="list-style-type: none"> <li>More than half (58%, n = 546) of nurses were not confident in their ability to care for disaster patients</li> </ul>

Nilsson et al. (2016)	Sweden	227 nurses 569 student nurse	Convenience Sampling Sampling size determined	To describe and compare self-reported disaster nursing competence in nursing students and registered nurses with professional experience	Descriptive Study	Nurse Professional Competence (NPC) Scale (Nilsson et al. 2016) Cronbach's alpha 0.70	<ul style="list-style-type: none"> <li>Nurses reported moderate readiness to manage violence, serious events, and disasters.</li> <li>Nurses working in emergency units had higher disaster competence than nurses in other units</li> <li>Nurses obtained EPIQ mean score of below the accepted level</li> </ul>
Ibrahim (2014)	Saudi Arabia	252 nurses	Convenience Sampling	To examine nurses' knowledge, attitudes, practices and familiarity regarding disaster and emergency preparedness	Cross-sectional design	Emergency Preparedness Information Questionnaire (EPIQ) (Garbutt et al., 2008) Cronbach's alpha not mentioned	<ul style="list-style-type: none"> <li>Nurses reported low to moderate level of disaster preparedness.</li> <li>Disaster knowledge and skills were rated below acceptable score</li> </ul>
Usher et al. (2015)	Bangladesh, Bhutan, Cambodia, China, Laos, Nepal, Solomon Island	757 nurses	Convenience sampling Sampling size not determined	To assess Asia-Pacific nurses' perceptions about their level of disaster knowledge, skills and preparedness	Cross-sectional design	Modified Disaster Preparedness Evaluation Tool (Tichy et al. 2009) Cronbach's alpha 0.90	<ul style="list-style-type: none"> <li>Nurses reported low to moderate level of disaster preparedness.</li> <li>Disaster knowledge and skills were rated below acceptable score</li> </ul>
Fung et al. (2008)	Hong Kong	164 nurses	Convenience sampling Sampling size not determined	To explore Hong Kong nurses' disaster preparedness	Questionnaire survey	Research-made questionnaire. Questions were based on literature review Content validity was 0.94	<ul style="list-style-type: none"> <li>Majority of nurses (97.5%) were not adequately prepared to respond to disaster situations</li> </ul>
O'Sullivan et al. (2008)	Canada	1543 nurses	Convenience sampling Sampling size not determined	To assess perceptions of preparedness for disasters and access to support mechanisms	Web-based survey	Canadian Community Health Survey (CCHS)	<ul style="list-style-type: none"> <li>Nurses reported to be inadequately prepared to respond to different disaster events.</li> <li>Higher ratings of preparedness were noted in responding to outbreak of disease and natural hazards.</li> <li>Low rating of preparedness was noted for CBRN events (radiological, nuclear attacks and accidents)</li> </ul>

Table 1 Continued

Author	Settings	Samples	Sampling Method	Research Purpose	Research Design	Instrument	Major Findings
Labrague et al. (2016)	Philippines	170 nurses	Convenience sampling Sampling size not computed	To examine the preparedness level of Philippine nurses	Descriptive, cross-sectional	Modified Disaster Preparedness Questionnaire (Fung et al. 2008)	<ul style="list-style-type: none"> <li>• Three fourths of nurses (80%) reported that they are not fully prepared for disasters</li> <li>• Majority of nurses (93.2%) reported not fully prepared for disaster situations in general: natural disasters (92%), biological attack (98.9%), and terrorist attack (98.5%)</li> </ul>
Goodhue et al. (2012)	USA	2627 paediatric nurses	Convenience sampling Sampling size not computed	To examine factors associated with paediatric nurse reporting to work in the event of a disaster	Survey approach	Personal Preparation Survey (PNP) (Chokshi et al., 2008)	<ul style="list-style-type: none"> <li>• Less than 40% of nurses reported that they are not personally prepared to care for patients during disaster events</li> </ul>
Whetzel et al. (2013)	USA	177 nurses	Convenience sampling Sample size not computed	To assess nurse's perception of their role in a disaster and their perceived susceptibility to a disaster	Descriptive survey	Researcher-made survey questionnaire consisting of 56 questions. Questions were developed based on an extensive literature review	<ul style="list-style-type: none"> <li>• Majority of nurses considers themselves having low to moderately prepare for disasters.</li> <li>• Low levels of preparedness were seen in relation to response to biological and chemical attacks</li> <li>• Nurses' level of preparedness and readiness to practice regarding disaster management was moderate</li> </ul>
Al Khalileh et al. (2012)	Jordan	474 nurses	Convenience sampling Sample size not computed	To assess Jordanian RNs' perceptions regarding their knowledge, skills, and preparedness for disaster management	Cross-sectional study	Disaster Preparedness Evaluation Tool (DPET) (Tichy et al. 2009) Cronbach's alpha is 0.91	<ul style="list-style-type: none"> <li>• Majority of nurses considers themselves having low to moderately prepare for disasters.</li> <li>• Low levels of preparedness were seen in relation to response to biological and chemical attacks</li> <li>• Nurses' level of preparedness and readiness to practice regarding disaster management was moderate</li> </ul>
Putra et al. (2011)	Indonesia	252 public health nurses	Stratified proportionate random sampling	To determine the level of perceived ability to practice of nurses in Aceh to deal with disaster-related nursing situations	Cross-sectional design	Public Health Nurse's Perceived Ability to Practice regarding Disaster Management Questionnaire (PHNPP-DMQ) Cronbach's alpha ranged is 0.92	<ul style="list-style-type: none"> <li>• Majority of nurses considers themselves having low to moderately prepare for disasters.</li> <li>• Low levels of preparedness were seen in relation to response to biological and chemical attacks</li> <li>• Nurses' level of preparedness and readiness to practice regarding disaster management was moderate</li> </ul>

Al Thobaity et al. (2015)	Saudi Arabia	429 nurses Six hospitals	Convenience sampling Sampling size computed	To evaluated disaster knowledge among nurses and to identify the sources of their knowledge and skills regarding disaster management	Descriptive research design	Disaster preparedness Evaluation Tool (DPET) (Tichy et al. 2009) Cronbach's alpha is 0.90	<ul style="list-style-type: none"> <li>In general, nurses perceived themselves as moderately prepared for disasters with mean score of 4.16 out of possible mean score of 5</li> <li>Mean scores for preparedness, response abilities, and evaluation all scored below normal on 6-point Likert suggesting poor disaster preparedness</li> </ul>
Öztekın et al. (2016)	Japan	902 nurses	Convenience sampling Sampling size not done	The objective of this study was to explore nurses' perceptions regarding their knowledge, skills and preparedness for disasters and how they acquired their knowledge about disaster preparation using a quantitative approach The aim of this study was to explore the perceived readiness of hospital nurses for a disaster response outside the hospital environment and to identify the factors influencing their report for work	Cross-sectional survey	Disaster preparedness Evaluation Tool (DPET) (Tichy et al. 2009) Cronbach's alpha is 0.90	<ul style="list-style-type: none"> <li>Mean item scores for personal preparation, self-protection, emergency response, and clinical management indicate low level of self-reported readiness for disaster responses</li> </ul>
Tzeng et al. (2016)	Taiwan	311 nurses	Convenience sampling Sampling size not determined		Cross-sectional study	Researcher-made instrument consisting of 42 items Cronbach's alpha is 0.96	<ul style="list-style-type: none"> <li>Mean item scores for personal preparation, self-protection, emergency response, and clinical management indicate low level of self-reported readiness for disaster responses</li> </ul>

remainder originated from Australia (Duong 2009), Canada (O'Sullivan et al. 2008), Hong Kong (Fung et al. 2008), Indonesia (Putra et al. 2011), Japan (Öztekin et al. 2016), Jordan (Al Khalaileh et al. 2012), Saudi Arabia (Al Thobaity et al. 2015; Ibrahim 2014), Sweden (Nilsson et al. 2016), Taiwan (Tzeng et al. 2016) and the Philippines (Labrague et al. 2016). One study was conducted in multiple countries including Bangladesh, Bhutan, Cambodia, Laos, Nepal and Solomon Islands (Usher et al. 2015).

All of the studies reviewed utilized cross-sectional research design using a survey approach with questionnaires. Sample sizes ranged from 164 to 2627 nurses. Although all nurses, the study participants varied widely in terms of the specialty area they originated from. Different practice areas included medical, surgical, paediatric, psychiatric, operating room, critical care units, and accident and emergency units.

The tools used by researchers to measure preparedness of nurses varied greatly. Four studies used the Disaster Preparedness Evaluation Tool (DPET) to determine the level of disaster preparedness of nurses (Al Khalaileh et al. 2012; Al Thobaity et al. 2015; Öztekin et al. 2016; Usher et al. 2015). This tool consists of 68 items which measures nurses' readiness for disaster response and management. Another validated tool used by researchers is the Emergency Preparedness Information Questionnaire (EPIQ), which was used by three authors (Baack & Alfred 2013; Hodge et al. 2015; Ibrahim 2014). The tool was designed to capture nurses' familiarity to and preparedness for disasters. Other tools included the Disaster Preparedness Questionnaire, a 26-item instrument developed to evaluate nurses' preparedness for disasters (Labrague et al. 2016), the Personal Preparation Survey, a 27-item questionnaire consisting of Likert scale questions related to disaster preparedness (Goodhue et al. 2012) and the Nurse Professional Competence scale, which is an 88-item scale that assesses disaster nursing competence (Nilsson et al. 2016). The majority of researchers, however, used a self-designed questionnaire tool (Duong 2009; Fung et al. 2008; Jacobson et al. 2010; Putra et al. 2011; Tzeng et al. 2016; Whetzel et al. 2013). These tools varied in length and measured education, training, preparedness, knowledge and awareness.

#### **Reported level of disaster preparedness among nurses**

Despite the use of varying scales to measure disaster preparedness in nurses, a common finding among the reviewed literature is that nurses are inadequately prepared for disaster response. All studies reported that nurses had a low to moderate level of preparedness (Al Khalaileh et al. 2012; Al Thobaity et al. 2015; Baack & Alfred 2013; Duong 2009; Fung et al. 2008; Goodhue et al. 2012; Hodge et al. 2015; Ibrahim 2014;

Jacobson et al. 2010; Labrague et al. 2016; Nilsson et al. 2016; O'Sullivan et al. 2008; Öztekin et al. 2016; Putra et al. 2011; Tzeng et al. 2016; Usher et al. 2015; Whetzel et al. 2013).

Labrague et al. (2016) explored the perceived level of disaster preparedness among staff nurses in the Philippines. The study found that approximately 80% ( $n = 136$ ) of nurses recognized they were not sufficiently prepared and were not confident in responding effectively to any disasters. Less than one quarter of nurses ( $n = 34$ ) in the study considered themselves to be fully prepared to respond to a disaster. Nilsson et al. (2016) measured self-reported disaster preparedness among registered nurses in Sweden. A mean score of 69.77 out of a possible score of 100 was obtained suggesting that nurses were moderately prepared to manage emergencies and disaster events. Öztekin et al. (2016) explored disaster preparedness among staff nurses in Japan. The study reported low mean scores for disaster readiness, disaster response and disaster evaluation, suggesting nurses were not adequately prepared to respond to disaster events. Tzeng et al. (2016) who explored disaster preparedness in Taiwanese nurses also revealed low mean scores among nurses in relation to personal preparedness, self-protection, emergency response and clinical management of disasters. These results indicate a low level of self-reported readiness for disaster response. Interesting to note is that higher levels of disaster readiness were reported in relation to clinical management, while lower scores were reported in relation to the self-protection domain.

In two separate studies conducted in Saudi Arabia to assess knowledge on disasters among nurses working there, nurses perceived themselves to be moderately prepared for disaster events (Al Thobaity et al. 2015; Ibrahim 2014). Usher et al. (2015) explored disaster preparedness, knowledge and skills of nurses in a number of Asian-Pacific countries and reported that nurses in Bangladesh and Laos felt unprepared to treat disaster victims without the presence of the physician, while nurses in Cambodia and Solomon Islands felt unprepared to perform assessments related to biological and chemical agents. Similarly, Hodge et al. (2015) explored readiness of nurses in the United States to respond with disastrous events. Nearly half of nurses (44.6%) rated themselves as unprepared for any disasters.

Baack & Alfred (2013) assessed disaster preparedness in 620 staff nurses in the United States. The study found that nurses obtained a mean score of 90 out of possible score of 205 on the EPIQ suggesting a suboptimal competence in responding to disaster events. A study conducted by Whetzel et al. (2013) examined individual emergency and disaster preparedness in emergency nurses in the United States using a self-designed survey questionnaire. The questionnaire was designed based

on a review of literature and clinical expertise. Nurses were asked to rate the extent to which they were prepared when disaster occurs. Less than 50% ( $n = 79$ ) of the respondents indicated they were fully prepared to provide direct patient care during disaster situations.

Al Khalaileh et al. (2012) explored preparedness of nurses in Jordan and found that around 65% of nurses rated their state of disaster preparedness as low or poor. Specifically, these nurses rated themselves as inadequately prepared in areas of disaster response such as conducting comprehensive health assessments relative to chemical and biological agents as well as undertaking organizational logistics and roles. Goodhue et al. (2012) who explored disaster preparedness among paediatric nurses in United States revealed that more than 90% ( $n = 641$ ) of the participants in their study felt unprepared to respond either to man-made or natural disasters. Jacobson et al. (2010) explored disaster preparedness among rural nurses and found that 60% ( $n = 546$ ) of nurses in their study reported that they are not adequately prepared to participate in disaster response and are not ready to care for disaster victims.

In Indonesia, Putra et al. (2011) explored readiness for disasters in a group of public health nurses. The study found that nurses displayed a moderate level of readiness for disaster response specifically in areas related to identifying disaster prone/risk areas, recognizing command structure during disaster and reporting. Duong (2009) explored disaster knowledge and awareness among emergency nurses in Australia. The study concluded that nearly half (45%) of nurses in perceived themselves to be poorly prepared for disasters. Fung et al. (2008) who explored disaster preparedness among registered nurses in Hong Kong reported that a large proportion ( $n = 159$ ) of the participants in their study stated that they are ill-prepared to respond when a disaster strikes with only 3% ( $n = 5$ ) expressing confidence in their own personal preparedness. O'Sullivan et al. (2008) assessed Canadian nurses' perceptions of disaster preparedness. Nurses Respondents were asked to indicate in a 4-point Likert scale their preparedness to natural disaster, nuclear attack, chemical weapons attack, disease outbreak and radiological attack. Low preparedness was observed predominantly in relation to chemical, biological, radiological and nuclear (CBRN) events with higher levels of preparedness reported in relation to responding to infectious disease outbreak. Overall, the authors concluded that participants were inadequately prepared to respond to disaster situations.

#### **Previous disaster response experience**

Six studies associated previous disaster response experience with a higher perceived level of disaster preparedness (Al

Thobaity et al. 2015; Baack & Alfred 2013; Nilsson et al. 2016; O'Sullivan et al. 2008; Tzeng et al. 2016; Usher et al. 2015). For example, Baack & Alfred (2013) reported that nurses' previous experience with major disasters influenced their perceived competence in disaster preparedness. This is consistent with findings of O'Sullivan et al. (2008) who found that nurses' with previous exposure to infectious disease outbreaks including the 2009 Severe Acute Respiratory Syndrome (SARS) had a higher perception of disaster preparedness. Al Thobaity et al. (2015) reported that a quarter of the nurses in their study attributed the main source of disaster knowledge and skills to previous involvement in actual disaster events and Tzeng et al. (2016) reported that previous disaster response experiences, disaster-related training and military experiences predicted a higher level of personal disaster preparedness in nurses. This aligns with a finding by Usher et al. (2015) that advanced age, disaster education and training and previous disaster involvement was a predictor for increased disaster competence and preparedness in nurses. In one study, nurses who had experience working in emergency units reported higher readiness for disasters (Nilsson et al. 2016). This finding was attributed by the author to nurses' previous experience of handling emergency and disaster victims.

#### **The role of disaster training or courses**

Five studies highlighted the role of disaster-related training as an effective way in which nurses can enhance their disaster knowledge and skills (Al Thobaity et al. 2015; Fung et al. 2008; Labrague et al. 2016; Öztekin et al. 2016; Tzeng et al. 2016). For example, Tzeng et al. (2016) found that nurses who had previously undertaken disaster training reported higher personal preparedness for disaster response. Similarly, the majority of respondents in a study by Al Thobaity et al. (2015) reported that most of their disaster management knowledge and skills were acquired from actual drills and disaster trainings. These findings align with Öztekin et al. (2016) who revealed that regular disaster or emergency drills were helpful in preparing nurses to respond to disasters. In separate studies conducted in the Philippines (Labrague et al. 2016) and Hong Kong (Fung et al. 2008), nurses identified first aid training, field triage, advanced basic life support and infection control as training needs that are essential in preparing nurses for disaster response. In addition, real-time exercises, desk top exercises, pre-hospital life support and practice drills and scenarios were also cited as necessary experiences to adequately prepare nurses to respond to disaster situations (Duong 2009; Labrague et al. 2016). In one study, nurses expressed preference for an

instructor led, small group disaster workshop online (Jacobson et al. 2010).

#### Awareness of and execution of workplace disaster plans

Seven studies discussed nurses' awareness of their workplace disaster protocols or plans as a factor in disaster preparedness (Al Khalaileh et al. 2012; Duong 2009; Fung et al. 2008; Ibrahim 2014; Labrague et al. 2016; Öztekin et al. 2016; Whetzel et al. 2013). The majority of nurses in five studies (Duong 2009; Fung et al. 2008; Ibrahim 2014; Öztekin et al. 2016; Whetzel et al. 2013) reported an awareness of the existence of a disaster management protocol in their workplace. However, in spite of their awareness, one quarter of nurses in the Whetzel et al. (2013) study had not read the plan and 10% ( $n = 17$ ) did not know how to locate the plan. In other studies, 42% ( $n = 72$ ) of participants stated they were aware a plan existed (Labrague et al. 2016) and 80% ( $n = 379$ ) of nurses in Al Khalaileh et al. (2012) study were not confident in executing the plan or protocol. Similarly, less than 50% ( $n = 685$ ) of Canadian nurses indicated their workplace has a formal emergency plan and most of the respondents were uncertain regarding the existence of adequate institutional policies and programs for large-scale disasters (O'Sullivan et al. 2008). In Saudi Arabia, 39.2% ( $n = 99$ ) of nurses did not know whether their hospital disaster plan is periodically updated (Ibrahim 2014). Nearly half (46%) of nurses in Duong's study stated they have not read their hospital plan.

#### Strategies to enhance disaster preparedness

Several recommendations aimed at enhancing preparedness in nurses were put forward in the literature. Both Labrague et al. (2016) and Baack & Alfred (2013) suggested offering nurses opportunities to participate in disaster training and actual drills to improve their confidence and familiarity in responding to disasters. Other authors recommended improving disaster preparedness for multiple disaster scenarios, especially for attack scenarios through extensive trainings and drills, and offering in-house nursing education to meet nurses' need for disaster preparedness (Duong 2009; O'Sullivan et al. 2008; Öztekin et al. 2016). Involvement in institutions' disaster planning was suggested by Goodhue et al. (2012) along with the provision of all-hazards disaster training opportunities for all nurses. Alternatively, Nilsson et al. (2016) and Ibrahim (2014) suggested providing nurses with disaster exercises based on realistic threats and simulation as a way of enhancing their disaster competence and readiness. Hodge et al. (2015) suggested the development of an emergency preparedness course for nurses that includes self-study modules built upon essential disaster competencies.

## Discussion

The most significant finding from this review is that nurses are ill-prepared for disaster response. When this finding is considered in relation to the fact that most of the research originated from Asian countries (Al Khalaileh et al. 2012; Al Thobaity et al. 2015; Fung et al. 2008; Ibrahim 2014; Labrague et al. 2016; Öztekin et al. 2016; Putra et al. 2011; Tzeng et al. 2016; Usher et al. 2015), which have the highest reported incidences of disaster events, this emphasizes the need for further research originating from other countries and nursing populations with less experience with disaster response. A disaster can potentially occur anywhere at any time in any community. Nurses therefore need to be prepared to respond so that negative consequences on the affected population can be mitigated. A wider cross section of research that explores nursing preparedness worldwide could better inform nurses' preparedness for disasters.

While the literature reports that there is a general lack of disaster awareness among nurses, this is largely perception-based and does not necessarily rely on objective data. Many of the tools that were used to determine preparedness were based on nurses self-reporting their perceptions of preparedness. This highlights the need for more research that explores what factors predict low preparedness for actual disaster response.

Consideration of the methodology used throughout the reviewed literature emphasizes the necessity for a more rigorous approach to research that explores nursing preparedness for disaster response. Major variability was noted in the instruments used for data collection. Only four studies used a validated tool that specifically aimed to measure disaster preparedness in nurses, the Disaster Preparedness Evaluation Tool (DPET; Al Khalaileh et al. 2012; Al Thobaity et al. 2015; Öztekin et al. 2016; Usher et al. 2015). The DPET, which was developed by Tichy et al. (2009), is designed to capture nurses' disaster knowledge, skills and disaster management and response. Other instruments used were not specific to assessing disaster preparedness in nurses. Variability was also noted in the content and structure of the instruments. In most studies reviewed, disaster preparedness in nurses was explored through the use of a single item/question only. According to Slepski (2005), disaster preparedness consists of competencies (disaster knowledge and skills) that are required to respond effectively to disaster events. This raises the question as to whether a single item/question is sufficient enough to capture nurses' preparedness levels. Certainly, this raises some concern and doubts on the preciseness of nurses' responses.

Only four studies (Al Thobaity et al. 2015; Baack & Alfred 2013; Nilsson et al. 2016; Putra et al. 2011) conducted a

power analysis to determine the sample size. Moreover, only one study utilized rigorous sampling (Putra et al. 2011), while the remaining studies used convenience sampling (Al Khalaileh et al. 2012; Al Thobaity et al. 2015; Baack & Alfred 2013; Duong 2009; Goodhue et al. 2012; Ibrahim 2014; Nilsson et al. 2016; O'Sullivan et al. 2008; Öztekin et al. 2016; Putra et al. 2011; Usher et al. 2015). The utilization of convenience sampling may have influenced the generalizability of the findings. A rigorous sampling method may yield different results. Future studies should be conducted utilizing a rigorous sampling method with a large enough sample size to make the results applicable and transferable to other settings.

It is difficult to independently generalize the findings from the majority of the studies because eight of the studies used samples from one location or hospital. This limits the findings of each study to one homogenous culture. While the findings may not individually be transferable across populations, considered as a whole, the findings of all the studies generally support each other in recognition of the fact that nurses across different cultures and regions feel generally under-prepared for disaster response. Again, a wider cross section of studies might further support this finding.

Despite the methodological challenges identified in this review, it was clearly evident from these studies that nurses are feeling generally unprepared and insecure in responding effectively to disasters. This is reflected in findings from other studies that explore nurses' experiences of disaster response (Arbon et al. 2006; Corrigan & Samrasinghe 2012; Hammad et al. 2012). The preparation of nurses for disaster response is considered an ethical and humanitarian requirement (Turale 2014). Nurses, as the largest healthcare workforce group have a major role in disaster response and should therefore have a basic understanding of disaster science and be equipped with competencies to better support their response to disaster situations (Tichy et al. 2009; Turale 2014). These findings therefore challenge nursing educators and hospital administrators to bridge the gap between disaster knowledge and skills into preparedness.

Another finding of this review was that previous disaster response experience to actual disaster events and having disaster-related training and exercises is seen as important in preparing nurses for disasters. However, it is not clear from the reviewed research what type of disaster-related training is effective in adequately preparing nurses. Nevertheless, view is supported in other literature that highlights the relevance of adequate education and training relative to disasters in improving individual perceptions of preparedness (Corrigan & Samrasinghe 2012; Hammad et al. 2012).

The present review also demonstrates a lack of awareness in relation to institutional disaster plans. Although many

nurse respondents in this review were cognizant of the existence of a workplace disaster protocol/plan, they were unclear of their role and most of them felt incapable regarding execution of the disaster plan. This highlights the need for nurses to be actively involved in all stages of disaster planning, so they can have a better perspective of their roles and responsibilities during disaster events (Achora & Kamanyire 2016).

## **Recommendations**

The findings of this review contribute to a growing body of knowledge regarding disaster preparedness in nurses and have implications for nursing administration, practice, and academia.

### **Implications for nursing policy**

Identification of factors that contribute to nurses' lack of preparedness for disaster response such as a lack of awareness of institutional plans as well as the relevance of disaster drills and exercises for increasing preparedness among nurses is critical. These findings place an emphasis on hospitals and other healthcare settings to implement policies to address a lack of preparedness among their employees. Doing so will create a more confident and prepared workforce that will in turn respond more effectively to a disaster.

### **Implication to nursing practice**

This review also reported that nurses with previous disaster response experience were better prepared for disasters than those without prior experience. This finding highlights the benefit of further research to harness the knowledge gained from nurses who have responded to actual disaster events for the benefit of the nursing profession as a whole. Furthermore, provision of realistic disaster exercises that mimic actual events would be useful to enhance the preparedness of their nursing workforce. Considering the frequency and unpredictability of disasters, periodic disaster-capacity building activities may be essential to adequately prepare nurses to respond and better manage disasters. Such activities may include actual mock drills, exposure to disaster simulations, and participations and attendance in skills trainings such as first aid training, life support training and disaster planning. In agreement with previous authors, providing nurses with simulation activities to improve their disaster competence and readiness maybe an asset (Ibrahim 2014; Nilsson et al. 2016).

### **Implication to nursing education**

The general lack of disaster preparedness among nurses that emerged from this review highlights the role that nursing educators can play in preparing nurses. Studies have

demonstrated that nursing curricula has a limited amount of disaster-related content (Ranse et al. 2013a,b; Usher & Mayner 2011). Inclusion of disaster topics into both undergraduate and postgraduate curriculums can have the effect of raising awareness among nurses. This awareness can be taken into nurse's everyday professional life and may support them to seek out further training and preparedness activities.

### Limitations of the study

Although this study was intended to provide foundational knowledge related to our current understanding of disaster preparedness among nurses, one limitation of the review was identified. All of the studies included for review are published in English language. This means that potentially relevant research published in other languages was excluded. Despite this, it is common to publish in English language journals, so it is hoped that the majority of research relevant to the topic has been included.

### Conclusion

It is clear from this systematic review that nurses feel ill-prepared to respond effectively to disasters. Exposure to actual disaster events and provision of disaster-related training and exercises was seen as an effective way to adequately prepare nurses for disaster management and response. The findings of this review offer valuable information for nurse educators, hospital administrators and researchers in supporting nurses to be sufficiently prepared for disaster response. However, there is a need for further research to identify factors that support disaster readiness and preparedness in nurses.

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### Author contributions

Study design: LL, KH, DM, DG, DF, AC, AO, ML, and EM

Data collection: LL, KH, DM, DG, DF, AC, AO, ML and EM

Data analysis: LL, DM, DG, DF, AC, EM and ML

Study supervision: LL, KH, DM, DG, and AO

Manuscript writing: LL, KH, DM, DG, DF, AC, AO, ML and EM

Critical review for important intellectual content: LL, KH, DM, DG, DF, AC, AO, ML and EM

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