

REVIEW

Nursing skills required across natural and man-made disasters: A scoping review

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Abstract

Aims: To map the nursing skills required for different types of disasters.

Design: This was a scoping review of research studies conducted between July and August 2021. We conducted a systematic literature search of nine electronic databases from inception till July 2021, and an updated search was done in April 2022. This review is based on the methodological framework of Arksey and O'Malley (2005), which was further refined by the Joanna Briggs Institute.

Data Sources: A range of electronic databases was searched systematically, including CINAHL, Cochrane, Embase, MEDLINE, PsycINFO, PubMed, Web of Science, CNKI and Ichushi-Web. Articles published in Chinese, English and Japanese were selected for the review.

Review Methods: The PCC model was used to frame the inclusion criteria. Studies were screened, appraised and extracted by two reviewers, and the study findings were narratively synthesized.

Results: We identified nursing skills for five types of natural disasters including (1) earthquakes, (2) typhoons, (3) tsunamis, (4) marine disasters and (5) infectious diseases and three man-made disasters: (1) radiation disasters, (2) bioterrorism and (3) war. Among these, there are five types of common professional skills nurses are required to possess including casualty triage, observation and monitoring, basic first aid techniques, psychological care and communication skills. In addition, it was shown that different disasters require different specific professional skills.

Conclusion: This scoping review explored the disaster nursing skills required for eight types of disasters and provides evidence for future education and training. Further research is needed to build more accurate scenario-based simulation training programs to provide more insights into future disaster precision nursing.

Impact: This scoping review provides evidence for future education and training in disaster nursing to improve nurses' knowledge and competencies in dealing with the different types of disaster situations.

KEYWORDS

disaster, disaster nursing, nurse, nursing skill, scoping review

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1 | INTRODUCTION

The COVID-19 pandemic has been a wake-up call for how the world defines global public health and global health security and has highlighted the role of nurses as a fundamental axis of health-care (Barrett & Heale, 2021). Nurses play a vital role in public crises and disasters. Hence, nurses must possess adequate knowledge and skills to respond appropriately to different types of disasters (Firouzkouhi et al., 2021; Hasan et al., 2021). However, nurses also face several challenges in all stages of a disaster. It is challenging for nurses to prepare for different types of disaster relief, especially given a lack of relevant disaster nursing knowledge and skills (Labrague et al., 2018; Littleton-Kearney & Slepski, 2008; Songwathana & Timalisina, 2021; Yin et al., 2011). Labrague et al. (2016) explored the level of Philippine nurses' perception of their disaster preparedness and found that about 80% of nurses were not fully prepared for any disaster. Meanwhile, in a previous systematic review that explored the disaster preparedness of American, Chinese and Japanese nurses (Labrague et al., 2018), it was shown that 44.6% of American nurses rated themselves as unprepared for any disaster (Hodge et al., 2017). The average scores of Chinese nurses for personal preparation, emergency response, disaster clinical management and self-protection have been reported to be low (Tzeng et al., 2016), and the average scores for disaster evaluation, disaster readiness and disaster response among Japanese nurses have also been low (Öztekin et al., 2016). As there is no accurate way to predict when and where a major disaster will occur, maintaining a continuous state of preparedness is essential to be able to respond quickly and effectively in the event of a disaster. Therefore, disaster preparedness education and training are critical for nurses to ensure that they possess the necessary knowledge and skills (Hilton & Allison, 2004; Labrague et al., 2018). Recently, the World Health Organization (WHO) and the International Council of Nurses (ICN) (2019) have collaborated to develop and update a range of competencies required for disaster nursing. These capabilities may resolve some of the concerns raised. However, there is little research evidence to guide educators when developing the content of disaster nursing training programs, and the multiplicity and diversity of disasters have led to variations in the content of disaster care responses (Littleton-Kearney & Slepski, 2008; Steed et al., 2004).

1.1 | Background

Recently, the 2020 Global Natural Disaster Assessment report (2021) has shown that in 2020, a total of 1313 major natural disasters occurred worldwide, affecting 123 countries and regions. Disaster is defined by World Health Organization (WHO, 2002) as 'an occurrence disrupting the normal conditions of existence and causing a level of suffering that exceeds the capacity of adjustment of the affected community'. Meanwhile, Guha-Sapir et al. (2017) define it as 'a situation or event that

overwhelms local capacity, necessitating a request at the national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering'. The types of disasters include not only natural disasters but also man-made disasters, both usually resulting in mass casualties (Stangeland, 2010). In 2008, research showed that 40% of natural disasters occurred in Asia, and the Western Pacific region frequently experiences large-scale casualties during natural disasters (Usher & Mayner, 2010). A report published by the Center for Research on the Epidemiology of Disasters (Guha-Sapir et al., 2017) showed that the world's most costly natural disasters have included floods in China, the Kumamoto earthquake in Japan, and Hurricane Matthew in the United States. In recent years, the frequency of natural disasters and man-made disasters has increased worldwide, causing a large number of deaths, injuries, economic losses and damages.

In the United States, few nurses had received formal education and training in the field of disaster response before 2001; however, following the attacks on the World Trade Center in New York and exposure to anthrax in the eastern United States, disaster nursing education in American schools of nursing had increased marginally (Littleton-Kearney & Slepski, 2008; Usher & Mayner, 2010). Japan is vulnerable to natural disasters because of its climate and topography, and large-scale disasters have occurred every 5–10 years since the Great Hanshin-Awaji Earthquake of 1995. In addition, the Japan Society of Disaster Nursing (JSDN) was established in 1998, and research and education in the field of disaster nursing have been promoted (Takahashi et al., 2019). In China, disaster nursing education and training began late. In 2003, the outbreak of severe acute respiratory syndrome (SARS) promoted the development of disaster nursing; however, it was not until the Wenchuan earthquake in 2008 when it began to receive greater attention. Subsequently, in 2009, the Disaster Nursing Professional Committee of the Chinese Nursing Society was formally established to develop disaster nursing education in China (Zhong & Zhou, 2021). Nurses make up the largest component of the healthcare professionals and play an important role in disaster response (World Health Organization, & International Council of Nurses, 2009). However, there is still no clear definition of disaster nursing in the world, and the JSDN defines disaster nursing (Misawa & Ota, 2018) as 'the systematic and flexible utilization of disaster-related knowledge and skills, and cooperation with other professional fields, from pre-disaster to post-disaster to minimize the health hazards and life-threatening damage caused by disasters and help activities to improve life ability'.

Although a few disaster-related reviews exist, such as investigations on disaster response, management and education (Al Harthi et al., 2020; Labrague et al., 2018; Loke et al., 2021; Said & Chiang, 2020), few reviews have emphasized the disaster skills needed by nurses for different disasters. Further, a previous disaster management review indicated that the main barriers faced by nurses at all stages of disaster management including in poor formal education, insufficient preparedness, ethical and legal issues, etc. Educators and

researchers need to work hard to solve these problems and improve disaster nursing (Al Harthi et al., 2020). Previous disaster education review has shown that in the past 20 years, most of the publications on disaster nursing education and training programs have been reported in the United States, and most existing plans focus on disaster preparedness and response, however, there is no evidence that nursing professionals possess the skills needed for disaster management (Loke et al., 2021). Although many studies have been conducted on disaster nursing knowledge and competencies, owing to the variety of disasters and the different specialized skills required for various types of disasters, there is an urgent need for evidence to support high-quality training programs for nurses in a variety of disaster types. Thus, this study uses a scoping review to gain more insight into the skills necessary for different types of disasters.

2 | THE REVIEW

2.1 | Aim

This scoping review aimed to map the skills nurses requires for different types of disasters.

2.2 | Design

This scoping review summarized the evidence of nursing skills required for different types of disasters and was conducted according to Arksey and O'Malley (2005) methodological framework and further refined by the Joanna Briggs Institute (Peters et al., 2020). In addition, the PRISMA statement for scoping review protocols guided the review (Tricco et al., 2018).

2.3 | Search methods

Systematic searches of the electronic databases were conducted between July and August 2021 and updated the search in April 2022. The following electronic databases were searched: CINAHL, Cochrane, Embase, MEDLINE, PsycINFO, PubMed, Web of Science, CNKI and Ichushi-Web. In addition, the reference lists were searched for additional related articles. Articles published in Chinese, English and Japanese from the date of the databases' inception until 25 April 2022 were selected for the review. The following search terms were used: nurse, nurses, nursing, registered nurse, nurse practitioner, advanced practice nurse, APN, NP, or disaster nurses, and natural disaster, tech* disaster, disaster*, rescue, natural hazard, earthquake, tsunami, volcan*, drought, bushfire, fire, storm, heat wave, avalanche, blizzard, tornado, hurricane, typhoon, flood, bioterrorism, environmental disaster, chemical incident, nuclear accident*, war, infectious disease, pandemic, epidemic, outbreak, SARS, covid-19, and skills, competence, knowledge, or abilities.

TABLE 1 Inclusion and exclusion criteria

	Inclusion criteria	Exclusion criteria
Participants	Nurses	Nursing students Participants did not meet criteria
Context	Skills	Not related to disaster nursing skills
Concept	Natural disasters and man-made disasters	Not related to disaster
Type of studies	Original studies	Conference abstracts, books, letters, news, etc.
Language	English, Chinese and Japanese	Language issue

2.4 | Inclusion and exclusion criteria

To frame the study of inclusion criteria (Table 1), we used the 'PCC' model for this scoping review. For this study, the type of population (P) was nurses, including registered nurses, assistant nurses, nurse practitioners, advanced practice nurses or disaster nurses; the context (C) was the nurses' nursing skills, knowledge, competence or abilities; and concept (C) was the disaster, including natural disasters (earthquake or tsunami, etc.) and man-made disasters (bioterrorism or nuclear accident, etc.); sources of evidence utilized were original studies including qualitative studies, quantitative studies, mixed methodology studies and reviews. Some sources of evidence such as letters, conference abstracts and news were excluded because they would not be appropriate or useful to answer the research question.

2.5 | Study selection

The studies selected were according to inclusion and exclusion criteria. This process was conducted by the research team (YS, XVW, NO, MY, HH and YY). First, the first author (YS) screened the titles and abstracts for possible eligibility for review. Then two reviewers (YS and NO) independently read the titles and abstracts identified in the search. After the screening of eligible articles was completed, the full text was obtained and reviewed. Any disagreements during the screening process were determined through discussion with the third reviewer (YY) until an agreement was reached, and the research team continued reviewing and assessing the full text.

2.6 | Quality appraisal

Critical appraisal was performed to report the risk of bias. However, no article was removed as critical assessment is not mandatory in scoping review (Munn et al., 2018). The JBI appraisal checklist for qualitative research (Lockwood et al., 2015) and analytical

cross-sectional studies (Moola et al., 2020) were used to evaluate qualitative and quantitative studies. Mixed studies were evaluated using the Mixed Methods Appraisal Tool (MMAT) (Pluye & Hong, 2014). The risk of bias in individual studies was determined based on the answers to each item, items could be answered using either 'yes', 'no', 'unclear' or 'not applicable' or 'cannot tell'. If 70% of the answers were 'yes', then the risk of bias was considered low; if 50%–69% of the answers were 'yes', then the risk was considered moderate; if the 'yes' answers were below 50%, then the risk of bias was considered high (Melo et al., 2018; The Institute Joanna Briggs, 2014). In addition, narrative review articles were evaluated using a scale for the quality assessment of narrative review articles ([SANRA] Baethge et al., 2019). The six items of this tool can be scored as either 0, 1 or 2, from low to high, and the highest total score obtainable is 12. Two reviewers (YS and NO) independently and critically appraised the included articles.

2.7 | Data extraction and synthesis

After discussions among the research group, a data extraction table was formed according to the research purpose, which was adapted from the JBI scoping review method (Peters et al., 2020). The data extracted from the retrieved articles included the name of the author(s), publication year, country of origin; type of disaster explored; study design; purpose; sample method; subjects' sex, age and work experience; quality and skills. We used a narrative synthesis method to report study characteristics, context, quality and findings according to the above extracted data format that compares similarities and differences between studies (Barnett-Page & Thomas, 2009).

3 | RESULTS

3.1 | Selection process

A total of 989 abstracts were sourced from the nine databases. First, the duplicates were removed, and 639 records were retained. Then the relevance of the title and abstract was screened, leaving 82 articles for further review. Among those 82 articles, 70 articles were obtained and reviewed. Finally, 55 articles were removed following the study inclusion and exclusion criteria, and 15 articles were left for the final review. The study search and selection process are shown in Figure 1.

3.2 | Characteristics of included studies

The name(s) of the study author(s), publication years, countries of origin, types of disaster, nursing skills identified, etc. of the included studies are summarized in Table 2. The examined articles were published between 2008 and 2021. Of the 15 studies included in the

review, six were qualitative, six were quantitative studies, one used mixed methodology and two were literature reviews. Qualitative methods involved individual interviews, focus groups and questionnaires with open-ended qualitative questions to gather information. The methods of the quantitative studies involved data sets secondary analysis and questionnaires, and the mixed methods studies used individual interviews and questionnaires to gather information. The included studies were from various countries, with six undertaken in China, three in Japan, two in the United States and one each in Italy, Iran, Indonesia and Spain. Most disaster research in China focused on earthquakes, typhoons and infectious diseases. Meanwhile, in Japan, most research focused on earthquakes and radiation disasters. Furthermore, bioterrorism-related studies from the United States and Italy were included. Lastly, there are research on nursing skills related to war, and only found one study from the United States.

3.3 | Quality of studies

Out of 13 original studies, 62% were of low risk and 38% were of moderate risk, providing strong evidence for the quality of the articles to be reliable. For the two literature reviews, the maximum sum score was 12, of which the review on radiation disaster was 11. Meanwhile, the score for COVID-19 was only seven points because the review was published in the early stage of the COVID-19 and lacked literature evidence, mainly through the epidemic information and experience of the author, hence, the score was low. Table 2 shows the quality of articles included in this review.

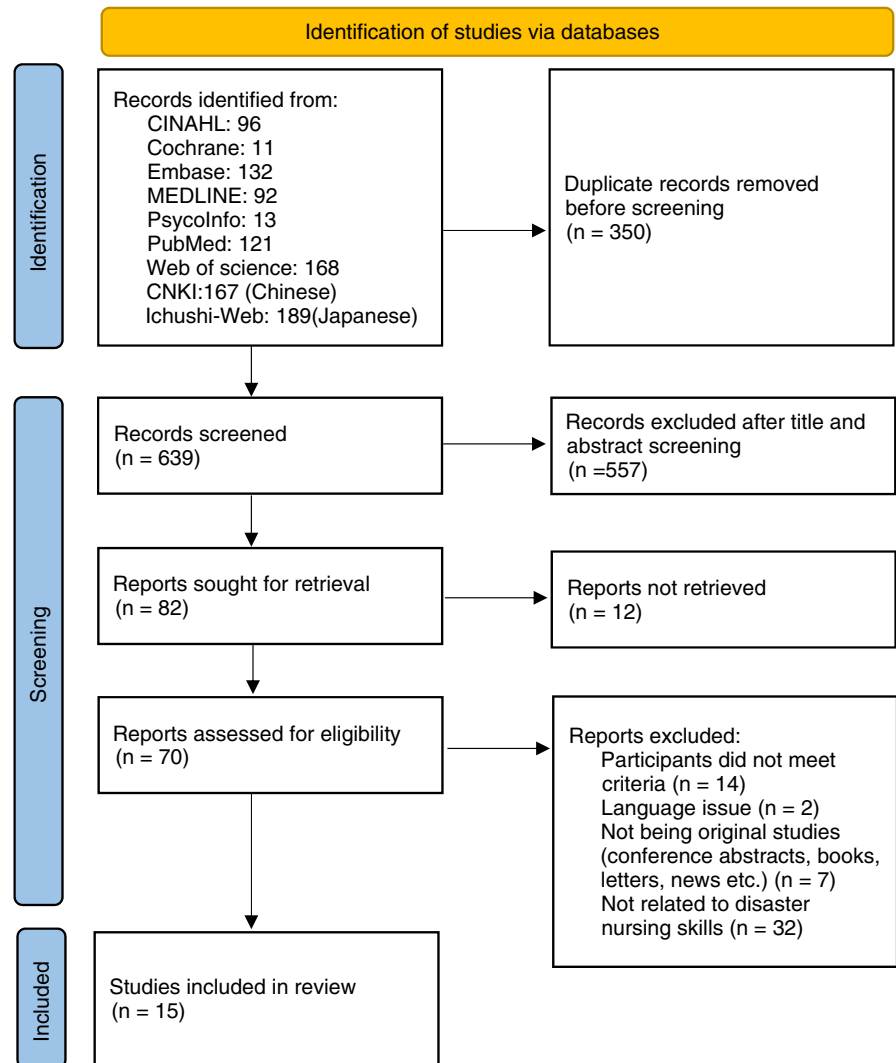
3.4 | Findings

We identified nursing skills for five different types of disasters among natural disasters and three different types of disasters among man-made disasters. Natural disasters included: (1) earthquakes, (2) typhoons, (3) tsunamis, (4) marine disasters and (5) infectious diseases. Man-made disasters included: (1) radiation disasters, (2) bioterrorism and (3) war. Table 3 presents a summary of required nursing skills for the different types of disasters. Among these, there are five common professional skills: casualty triage, observation and monitoring, basic first aid techniques, psychological care and communication skills. In addition, different types of disasters require different specific professional skills as shown in Table 4.

3.4.1 | Earthquakes

Four studies reported nursing skills required during earthquakes in China, Japan and Iran. The types of injuries most reported by nurses in the study included crush injuries and limb fractures. Yan et al. (2015) explored the disaster nursing skills, knowledge and attitudes of 89 Chinese nurses who had experience of earthquake

FIGURE 1 Study search and selection.
Adapted from Page et al. (2021).



relief efforts. The majority of nurses were women (95.4%), and 49.44% of nurses had 5–10 years of working experience. Nearly, half of the nurses stayed at the concerned disaster sites for 2–4 weeks. The majority had experience in relief efforts during the Wenchuan earthquake (93.26%). The majority were from cardiothoracic surgery/cardiology, orthopaedics and operating rooms. The findings have shown that the most important used skill for nurses reported was cardiopulmonary resuscitation (CPR), and the most frequently used skills were haemostasis bandaging, fixation, manual handling, observation and monitoring, wound debridement and dressing, and mass casualty transportation. Almost half of the nurses felt that knowledge of orthopaedics and how to deal with fractures would be useful to nurses when dealing with earthquake disasters. Yin et al. (2011) explored nurses' skills in the Wenchuan earthquake among 24 Chinese nurses who had been dispatched to disaster sites from 12 May to 14 May 2008. The nurses were all women, and more than half of them were between 26 and 35 years old. The majority had postgraduate experience (41.7%) and 54.2% had 1–5 years of experience. The findings showed that the most frequently used skills were for nurses reported were debridement and

dressing, observing and monitoring, intravenous insertion, haemostasis bandaging, fixation and manual handling. However, the most important used skill was intravenous insertion. Rezaei et al. (2020) explored the professional competencies of 16 Iranian nurses who had provided care to the injured during the Kermanshah earthquake. More than half of the nurses were women, and the average age and work experience were 34.1 ± 5.8 years and 10.8 ± 5.3 years respectively. The majority of nurses mentioned the following skills: controlling bleeding, CPR, airway management, shock treatment, debridement and dressing, bandaging and fixation. In addition, in life-threatening emergencies, nurses must have adequate skills in CPR and open airways to provide care to patients of different age ranges (including pregnant women, children and older adults). Hata (2010) explored required disaster nursing education required from 10 Japanese nurses who had experienced the Great Hanshin-Awaji Earthquake relief experience. These nurses with earthquake experience reported that the disaster skills required were triage transportation, bandaging, fixing, hygiene and personal care, technology that leads one to be close to others, and communication skills.

TABLE 2 Characteristics of research studies included ($n = 14$)

Author and year	Country	Disaster	Design/method	Purpose	Sample	Sex (female)	Age (years)	Working experience	Quality
Yin et al. (2011)	China	Earthquakes	Qualitative and focus group	To determine nursing skills most relevant for nurses participating in disaster response medical teams and to improve the capacity of nurses to prepare and respond to severe natural disaster	24 nurses	24 (100%)	18–25: 7 (29.2%) 26–35: 16 (66.7%) 36 or above: 1 (4.2%)	1–5 years: 13 (54.2%) 6–10 years: 4 (16.7%) 11–15 years: 6 (25.0%) 16–20 years: 1 (4.2%)	80% yes
Hata (2010)	Japan	Earthquakes	Qualitative: interviews	To determine the educational content required for disaster nursing education	Ten nurses worked in the disaster area hospital and had the Great Hanshin-Awaji Earthquake relief experience	10 (100%)	At the time of the disaster (1995): 34.8 ± 7.0	14.2 ± 7.9 years	80% yes
Yan et al. (2015)	China	Earthquakes	Qualitative questionnaire with open-ended qualitative questions	To explore the skills, knowledge and attitudes required by registered nurses from across China who worked in the aftermath of three large earthquakes to try to determine future disaster nursing education requirements	Eighty-nine nurses who had engaged in Wenchuan, Yushu or Mangliang earthquake disaster relief efforts for at least 1 day	85 (95.4%)	NA	<5 years: 11.24% (10) 5–10 years: 49.44% (44) 11–15 years: 19.10% (17) 16–20 years: 14.61% (13) 21–25 years: 3.37% (3) >25 years: 2.24% (2)	90% yes
Rezaei et al. (2020)	Iran	Earthquakes	Qualitative: semi-structured, face-to-face, in-depth interviews	To identify professional capabilities needed by nurses to provide care to the injured by earthquake	Sixteen nurses were involved in providing care to the injured in the Kermanshah earthquake	9 (56.3%)	34.1 ± 5.8	10.8 ± 5.3 years	80% yes
Husna et al. (2011)	Indonesia	Tsunamis	Quantitative	To describe the level of perceived clinical skills for tsunami care among nurses and to examine the relationship between knowledge, clinical experience and perceived clinical skills for tsunami care among nurses in Banda Aceh, Indonesia	Seventy-eight nurses in a provincial hospital in Banda Aceh, Indonesia	NA	NA	NA	75% yes
Qin et al. (2014)	China	Marine disasters	Qualitative: literature review, theoretical analysis and Delphi expert consultation	To build the core of marine disaster rescue capability of civilian nurses in the military hospital system	Seven nurses	NA	NA	NA	70% yes
Huang et al. (2016)	China	Typhoons	Mixed method	To establish 'nurse typhoon disaster rescue' knowledge manual and evaluate application effect	Twelve experts 140 nurses	NA	NA	NA	80% yes

TABLE 2 (Continued)

Author and year	Country	Disaster	Design/method	Purpose	Sample	Sex (female)	Age (years)	Working experience	Quality
Peiro et al. (2020)	Spain	COVID-19	Quantitative	To draw lessons for nursing education, the present study analysed the stress experience and coping strategies of nurses from the Spanish health system	Four hundred and three nurses from the Spanish health system	NA	NA	NA	63% yes
He and Zhang (2020)	China	COVID-19	Review	To summarize the working features of nurses caring for patients with novel Coronavirus pneumonia	Based on enormous sources of the novel Coronavirus outbreak and the authors' own experiences	NA	NA	NA	Score: 7
Li et al. (2021)	China	COVID-19	Quantitative	To investigate nurses' core emergency competencies for handling the COVID-19 and analyse the factors associated with those competencies	Total of 2570 nurses from 22 provinces of China	96.5% (2479)	32.0 ± 7.4	10.6 ± 8.3 years	88% yes
Sato and Nishizawa (2019)	Japan	Radiation disaster	Qualitative: semi-structured interview	To clarify the knowledge and practical abilities required by professional nurses, nursing students and nursing teachers to provide appropriate radiological nursing care in a radiation disaster	Fourteen experts involved in radiation disaster nursing	71.4% (10)	50.2 ± 9.2	15.6 ± 9.9 years	80% yes
Sasatake et al. (2017)	Japan	Radiation disaster	Review	To examine the contents of the Radiation Emergency Medicine (REM) and nursing practice in Japan	Studies on the REM have been published in Japan	NA	NA	NA	Score: 11
Rebmann and Mohr (2010)	United States	Bioterrorism	Quantitative	To evaluate nurses' knowledge regarding non-disease-specific aspects of bioterrorism preparedness	Four hundred and seventy-four Missouri Nurses Association members	446 (96.7%)	<30: 2.4% (11) 31-40: 4.3% (20) 41-50: 31.3% (144) 51-60: 41.3% (190) >61: 20.7% (95)	NA	63% yes
De Felice et al. (2008)	Italy	Bioterrorism	Quantitative	To identify intervention programs within the framework of basic and permanent nursing training	One hundred and eighty-seven nurses and nursing students	NA	Nurses: 41.5 and 36.9 years	NA	63% yes
Wilson et al. (2022)	United States	War	Quantitative	To determine the frequency of deployed nursing skills required for sustaining a casualty for the first 72 h after injury in accordance with relevant nursing individual critical task lists	Data set from the Department of Defence Trauma Registry (DODTR) with casualties	NA	NA	NA	63% yes

Abbreviation: NA, not applicable.

TABLE 3 Nursing skills included natural disasters and man-made disasters studies

Natural disasters	Author and year	Country	Skills
Earthquakes	Yin et al. (2011)	China	<ol style="list-style-type: none"> 1. Intravenous insertion 2. Observation and monitoring 3. Mass casualty triage 4. Emergency management 5. Haemostasis, bandaging, fixation, manual handling 6. Mass casualty transportation 7. Controlling specific infection 8. Debridement and dressing 9. Cardiopulmonary resuscitation 10. Patient care recording
	Hata (2010)	Japan	<ol style="list-style-type: none"> 1. Make people think about the teaching technique (triage transportation method) peculiar to disasters through the investment of simulated patients during triage adjustment 2. All other medical technologies are peculiar to disasters (bandage method) 3. The ingenuity of nursing technology that can be done without equipment or water (fixing method, transportation method, cleaning method, possession of cleanliness) 4. Technology uses oneself as a tool to be close to others 5. In the event of a disaster, you can enter the circle of people and communicate appropriately
	Yan et al. (2015)	China	<ol style="list-style-type: none"> 1. Cardiopulmonary resuscitation 2. Haemostasis, bandaging, fixation, manual handling 3. Emergency management 4. Observation and monitoring 5. Psychological crisis intervention 6. Mass casualty transportation 7. Debridement and dressing 8. Mass casualty triage 9. Controlling specific infection 10. Intravenous insertion
	Rezaei et al. (2020)	Iran	<ol style="list-style-type: none"> 1. Controlling bleeding 2. Cardiopulmonary resuscitation (CPR) 3. Controlling airways 4. Treatment of shock 5. Debridement and dressing 6. Bandaging and fixation 7. Skills in triage 8. Psychological care skills 9. Skills in observation and monitoring.
Typhoons	Huang et al. (2016)	China	<ol style="list-style-type: none"> 1. Pre-inspection triage 2. Do a good job of patient triage, pre-screening of infectious diseases, inspection and triage system 3. Condition observation and testing 4. General situation, vital signs, state of consciousness, pupil pair observation, etc. 5. Basic first aid techniques 6. Debridement, haemostasis, bandaging, fixation, transfer, transfusion, blood transfusion, cardiopulmonary resuscitation, etc. 7. Common types of injuries 8. Fall injuries, injuries from collapses, cuts and stabs, car accidents, electric shocks, drowning, crush injuries, etc. 9. Common injuries and other care 10. Nursing of soft tissue contusion and laceration, nursing of tendon rupture, nursing of limb fracture and dislocation, nursing of drowning, etc. 11. Nursing for special populations 12. Nursing care for the disabled, the older, children, pregnant women, etc. 13. Common ambulance equipment 14. Ventilator, infusion pump, automatic external defibrillator, etc. 15. Disaster mental health consultation and intervention 16. Identification of emotional and physiological reactions of disaster-affected persons and intervention of stress-related obstacles

TABLE 3 (Continued)

Natural disasters	Author and year	Country	Skills
Tsunamis	Husna et al. (2011)	Indonesia	<ol style="list-style-type: none"> 1. Patients for triage 2. Acute respiratory care 3. Wound care 4. Mental healthcare 5. Psychological care 6. Spiritual care 7. Patient referral in the hospital setting
Marine disasters	Qin et al. (2014)	China	<ol style="list-style-type: none"> 1. Environmental characteristics of coastal areas 2. The impact of the marine environment on injuries 3. Characteristics and nursing of war injuries and trauma at Sea 4. Characteristics of ship impact injury 5. Characteristics of underwater impact Injury 6. Marine infusion care 7. Sea-to-land transfer skills 8. Emergency barrier measures after trauma 9. Psychological knowledge of marine disasters 10. Property and material management 11. Legal knowledge and ethical issues in the ambulance
COVID-19	Peiró et al. (2020)	Spain	<ol style="list-style-type: none"> 1. Catastrophes (NBQ, epidemics) and drills 2. Waste management, protection of vulnerable groups, prevention, etc. 3. Basic training in important services 4. Intensive Care Unit; Emergency; Surgery, Critical Care Resuscitation Unit; Palliative Care, etc. 5. Specific techniques and technology use 6. Use of technology, techniques (MARS), surgery rooms and surgical instruments, etc. 7. Patients' treatment and clinical aspects 8. Research knowledge and skills
	He and Zhang (2020)	China	<ol style="list-style-type: none"> 1. Nosocomial infection prevention and control and basic Knowledge and techniques to prevent nosocomial cross-infection 2. Standardize the proper use of protective equipment such as hand hygiene 3. Isolation gowns 4. Disinfection and isolation methods inwards 5. Selection of appropriate protective measures according to different operations and jobs 6. Disinfection and isolation measures for infectious diseases, terminal disinfection treatment 7. Occupational exposure treatment, etc. 8. Management knowledge and ability of critically ill patients 9. Ventilator management, airway management, circulation support nursing, haemodialysis technology, etc. 10. Specialized Ability 11. First aid knowledge and ability 12. Cardiopulmonary resuscitation, use of respiratory airbags, and use of defibrillators as well as the ability to identify changes in the patient's condition, assess risk and predict 13. Knowledge and ability of respiratory support care 14. Knowledge and skills in oxygen therapy operations such as non-invasive mechanical ventilation and invasive mechanical ventilation. If necessary, use invasive mechanical ventilation combined with prone therapy or extracorporeal membrane oxygenation (ECMO) 15. Psychological nursing knowledge and ability, grief counselling knowledge and ability
	Li et al. (2021)	China	<ol style="list-style-type: none"> 1. Clinical features 2. Course of disease 3. Diagnostic criteria 4. Treatment principle 5. Specimen collection 6. Specimen preservation and transport psychological adaptation 7. Prevention and self-protective ability Security protection requirements 8. Protective equipment usage 9. Medical exposure dispose 10. Eligible hand hygiene 11. Medical waste disposal 12. Corpse disposal 13. Isolation principle in ward Environmental disinfection 14. Close contacts management

(Continues)

TABLE 3 (Continued)

Man-made disasters	Author	Country	Skills
Radiation	Mika Sato et al. (2019)	Japan	<ol style="list-style-type: none"> 1. Radiation disasters caused by nuclear power plant accidents 2. Professional knowledge: radiation disaster medical treatment and radiation exposure medicine, mechanisms that cause radiation accidents in nuclear power plants 3. Principles of radiation and radionuclides 4. Categories of radiation exposure 5. Usage of radiation and radionuclides in everyday life 6. Health effects and risks of radiation 7. Technique of radiation protection for external and internal exposures 8. Technique of prevention of spreading of radioactive contamination in the environment 9. Dose limits for nursing personnel 10. Risk communication 11. Practical: Radiological nursing (nursing examinations and treatment), decontamination, radiation protection 12. Psychological care: Correspondence with inhabitants, address patients' anxiety 13. Create radiation disaster response manuals
	Hikaru Sasatake et al. (2017)	Japan	<ol style="list-style-type: none"> 1. Professional knowledge: care for radiation emergency medicine, care for radiation exposure 2. Decontamination techniques: methods for decontaminating radioactive materials from foods and methods for preventing secondary radiation exposures 3. Practical nursing aid skill 4. To provide support to residents who are or may be affected by radiation contamination and exposure to them 5. To have the ability to identify those in need of medical attention based on the concept of emergency medicine and disaster medicine, to consider those vulnerable in disaster 6. To build a team with other organizations and professionals and to understand terminologies used commonly with other organizations and professional 7. Other (stable iodine tablets and their directions for use)
Bioterrorism	Rebmann and Mohr (2010)	United States	<ol style="list-style-type: none"> 1. Bioterrorism preparedness knowledge 2. Infection control 3. Decontamination procedures 4. Response procedures 5. Incident command system 6. Reporting an incident 7. Quarantine
	De Felice et al. (2008)	Italy	<ol style="list-style-type: none"> 1. Precautions against the ways of transmission of Bacillus anthracis 2. Precautions against the modalities of transmitting virus-induced encephalitis 3. The modalities for transmitting the smallpox virus and Y. pestis 4. Operational procedures for disposing of infected materials 5. The methods of transporting an affected person 6. The disinfectants used to clean up environmental contamination for purposes of continuous disinfection
War	Wilson et al. (2022)	United States	<ol style="list-style-type: none"> 1. Relevant pre-hospital skills 2. External warming 3. Intravenous access 4. Administration of parenteral opioids 5. Wound dressing 6. Administration of ketamine 7. Relevant hospital skills 8. Prepare for transfer to a higher level of care 9. Management post-operative 10. Manage serious head injury 11. Administration of packed red blood cells 12. Ventilator management 13. Administration of fresh frozen plasma 14. Arterial access 15. Assist with intubation

TABLE 4 Common and different nursing skills for each disaster

Disasters	Professional knowledge	Common professional skills	Different professional skills	What nursing specializations could play a significant role
Earthquakes	Orthopaedics and trauma nursing knowledge, basic first aid knowledge	<ol style="list-style-type: none"> 1. Casualty triage 2. Observation and monitoring 3. Basic first aid techniques 4. Psychological nursing 5. Communication skills 	<ol style="list-style-type: none"> 1. Common injuries and nursing skills: nursing for crush injuries and limb fracture and dislocation, etc. 	Emergency and orthopaedical nursing
Typhoons	Trauma nursing knowledge, basic first aid knowledge	<ol style="list-style-type: none"> 1. Pre-inspection triage 2. Observation and monitoring 3. Basic first aid technique 4. Psychological nursing 	<ol style="list-style-type: none"> 1. Common injuries and nursing skills: soft tissue contusion, laceration care, tendon rupture care, limb fracture and dislocation care, drowning care, etc. 	NA
Tsunamis	Trauma nursing knowledge, basic first aid knowledge	<ol style="list-style-type: none"> 1. Pre-inspection triage 2. Acute respiratory care 3. Psychological nursing 	<ol style="list-style-type: none"> 1. Common injuries and nursing skills: tsunami wound care 	Acute care, critical care and emergency nursing
Marine disasters	Trauma nursing knowledge, basic first aid knowledge	<ol style="list-style-type: none"> 1. Casualty triage 2. Psychological nursing 	<ol style="list-style-type: none"> 1. Common injuries and nursing skills: trauma care 2. Marine infusion care 3. Sea-to-land transfer skills 	Military nursing
Infectious diseases (COVID-19)	Hospital infection prevention and control knowledge, critical care and basic first aid knowledge	<ol style="list-style-type: none"> 1. Critical care patient management 2. Observation and monitoring 3. Basic first aid techniques 4. Respiratory support nursing 5. Psychological nursing 6. Communication Skills 	<ol style="list-style-type: none"> 1. Infectious disease management 2. Infection prevention and control 	Intensive care and haemodialysis care
Radiation	Radiation emergency medical nursing knowledge, radiation exposure nursing-related knowledge	<ol style="list-style-type: none"> 1. Basic first aid technique 2. Communication skills 	<ol style="list-style-type: none"> 1. Radiological nursing (nursing examinations and treatment) 2. Decontamination 3. Radiation protection 	Radiology nursing
Bioterrorism	Bioterrorism preparedness knowledge	<ol style="list-style-type: none"> 1. Basic first aid technique 	<ol style="list-style-type: none"> 1. Infection control 2. Decontamination procedures 3. Quarantine 	Infection control and public health nursing
War	Damage control resuscitation (DCR) and damage control surgery (DCS) care	<ol style="list-style-type: none"> 1. Basic first aid technique 	<ol style="list-style-type: none"> 1. Common injuries and nursing skills: battle injuries explosive and gun-shot wounds care, haemorrhage control, managing burns and providing external warming, etc. 	With emergency and critical care nurses

Abbreviation: NA, not applicable.

3.4.2 | Typhoons

Only one article from China focused on typhoons. Huang et al. (2016) developed a 'typhoon disaster rescue knowledge manual' for nurses with 12 experts in related fields. The skills required for typhoons included basic first aid techniques such as debridement, haemostasis, bandaging, fixation, transfer, transfusion, blood transfusion, CPR, etc.; specific professional knowledge and skills mainly including in relation to common injuries such as injuries from falls or collapses, cuts and stabs, car accidents, electric shocks, drowning, and crush injuries; and common care such as for soft tissue contusion and laceration, nursing of tendon rupture, nursing of limb fracture and dislocation and nursing of drowning. In addition, the manual was used

to train 140 nurses. After training, the rate of passing the technical assessments on haemostasis, bandaging, immobilization, transfer and CPR exceeded 90%.

3.4.3 | Tsunamis and marine disasters

Only one study from Indonesia reported on required nursing skills for tsunamis. Husna et al. (2011) described nurses' perceptions of their clinical skills in tsunami nursing. Nurses' clinical skills were divided into three levels: low, moderate and high according to the scores. The study showed that nurses perceived clinical skills in triage, acute respiratory care, wound care, patient referral,

spiritual, mental health and psychosocial care for tsunamis were moderate. Among these, the specific professional skills for tsunamis mainly include wound care. Future research should develop clinical practice guidelines for nursing skills in the acute response stage of a tsunami in a hospital. In addition, one study from China has reported on nursing skills related to marine disasters. Qin et al. (2014) constructed a core system for civilian nurses' maritime disaster rescue capabilities through expert interviews. The core system can provide evidence for emergency plans and disaster nursing education. The four parts of the core of marine disaster rescue capability were job competence education, nursing competence in first aid, disaster rescue competence and post-disaster management. Job competence includes psychological and physical fitness training, disaster environment adaptability, etc. Nursing competence in first aid includes basic knowledge and skills of first aid, multi-disease emergency care ability, emergency care risk assessment capabilities, etc. Among these, the specific professional skills of marine disaster rescue include marine war wound trauma care, marine infusion care and sea-land transfer skills.

3.4.4 | Infectious diseases

We found only one infectious disease study among the studies that explored natural disasters: studies on COVID-19. Three studies from Spain and China reported on nursing skills for COVID-19. Peiró et al. (2020) showed the valuable input of nurses from Spain on specific content which could be considered for future nursing education programs. The findings showed that years of experience can protect nurses from the stress of overworking, under-preparation and fear of infection. Lack of preparation reduces the motivation and opportunities to effectively respond to the demands of stressful situations and hinders the responses that seek support. Those who experience greater pressure (less experience) are more aware of the need to increase their professional knowledge and skills with regards to nurse education, as they struggle to cope with problems. Qualitative analysis of the recommendations made by the nurses showed that 70 (17.4%) of the 403 nurses offered a total of 112 educational content. More than half of the content involved transversal soft skills, whereas the rest involved technical or professional skills. Among these, the most important transversal soft skills were coping with stress and emotional management, followed by communication and interpersonal relationships. Li et al. (2021) investigated the core emergency capabilities of 2570 nurses in dealing with COVID-19 and analysed the factors related to these capabilities. In the study, nearly half of the nurses are from the department of internal medicine. Research has shown that nurses have better knowledge of COVID-19, followed by COVID-19 prevention and self-protection, as well as medical care capabilities. However, most nurses lack work experience in isolation wards and first aid training. Age, total working hours, job title, main work content, disaster rescue history, first aid training and infectious disease training have been shown to be related to

core emergency capabilities. He and Zhang (2020) summarized the characteristics of nurses' work in caring for COVID-19 patients based on a large number of resources related to COVID-19 and the authors' own experience. The two quality requirements for nurses working during the COVID-19 pandemic are physical quality and mental quality. The expected knowledge and competencies for frontline nurses are healthcare-associated infections prevention and control, management of critically ill patients, first aid skills, respiratory support care, psychological care and grief counselling.

3.4.5 | Radiation

Two studies from Japan reported on nursing skills in radiation disasters. Sato and Nishizawa (2019) clarified the requirements for nursing students, nursing teachers and clinical nurses regarding knowledge and practical ability required for radiation disasters through semi-structured interviews with 14 experts. Nursing students must possess the knowledge and practical abilities including in relation to radiation nursing, radiation protection basics, radiation emergency medicine (REM) and the role of nursing. Meanwhile, nurse teachers must possess the necessary knowledge and experience, including in relation to nuclear power plant accidents knowledge, hospital disaster prevention drills, dose measurement, radiation care and resident communication and basic radiation knowledge. The knowledge and practical competencies required for clinical nurses include knowledge and competencies related to the effects of radiation on health, resolution of patient anxiety, knowledge of radiation nursing and the role of nurses. In addition, respondents all mentioned the minimum radiation care skills required for nursing staff in nursing students' courses with eight items of knowledge and skills, as shown in Table 3 (Kusama, 2016). Further, the study also indicated the need to develop a 'hospital radiation hazard response manual' as a measure to deal with future radiation hazards. Sasatake et al. (2017) examined the contents of reports and examinations on the practice of REM nursing practice in Japan based on 178 studies, and five categories were extracted: 'national and regional systems', 'facility systems', 'education', 'knowledge and technology' and 'activity reports'. The extracted contents indicate the following roles of nurses: To prepare for the REM, nurses should acquire professional knowledge and skills related to radiation, along with practical nursing skills.

3.4.6 | Bioterrorism

Two studies from Italy and the United States reported on nursing skills in bioterrorism. Rebmann and Mohr (2010) assessed 474 Missouri nurses on the knowledge and perception of bioterrorism and the educational barriers that nurses face in this area. Among the nurses, 96.7% were women, and 79.8% had a bachelor's degree or higher. The findings show that the knowledge scores of most nurses were poor on the test, and 60% of the nurses reported that

they had not received bioterrorism education. The most common barrier to education was not knowing where to obtain training. The most commonly overlooked issues that should be addressed included infection control, decontamination procedures, response procedures, incident command systems, incident reporting and quarantining. De Felice et al. (2008) investigated the nursing knowledge of 187 nurses and nursing students about bioterrorism. The findings show that nurses and nursing students have insufficient knowledge about bioterrorism risk management and show that the most important information in the general bioterrorism training was the way of spreading pathogenic microorganisms such as smallpox, *Yersinia pestis* and encephalitis virus. In addition, the prevention methods require special attention including in relation to the mode of transmission of variola virus and *Yersinia pestis*, methods of transporting affected persons and disinfectants used to clean up environmental pollution or for continuous disinfection.

3.4.7 | War

Only one study from the United States reported on nursing skills for War. Wilson et al. (2022) described the frequency of nursing skills required for 12,268 casualties in the first 72 h after injury. This study found battle injuries are the most common, followed by explosive injuries. Of the relevant pre-hospital nursing skills, extracorporeal warming, administration of parenteral opioids and wound dressings were the most frequently performed. Blood gas interpretation, preparation for patient transfer to higher levels of care and post-operative patient management were the most performed nursing skills in the hospital setting. While early initiation of damage control resuscitation and damage control surgery is considered lifesaving, most of the basic care is usually provided by nurses. Although nursing care is highly required during the first 72 h of casualty care, few studies focus on the related nursing skills. Therefore, the findings suggest that specific nursing skills training is needed for nurses who support casualties to reduce casualty rates.

4 | DISCUSSION

This scoping review explored the skills required by nurses for different types of disasters as well as the nursing skills that need to be improved to ensure that nurses are prepared and possess the skills required for different disaster management. We identified nursing skills for eight different types of disasters in natural and man-made disasters, with common professional skills including casualty triage, observing and monitoring, basic first aid techniques, psychological care and communication skills. In addition, this study shows that different disasters require different specific professional skills. Studies included in this review originated from seven countries—China, Italy, Iran, Indonesia, Japan, the United States and Spain—published between 2008 and 2022.

This study elucidates the common and specific professional skills nurse should possess for eight types of disasters. Among these, skills related to earthquakes, typhoons, tsunamis, marine disasters and war focus on trauma care; skills related to infectious diseases focus on infection prevention and control; skills related to radiation disaster focus on radiation emergency medical nursing including radiation protection and radiological nursing and skills related to bioterrorism disasters focus on infection control, decontamination procedures and quarantining. Nurses should have the experience and expertise needed to carry out relevant professional disaster care as they often do not have access to the Internet or textbooks in that situation. However, there are research on tsunami-related nursing skills. Meanwhile, there are few reports on the different nursing skills related to radiation disasters in the United States, and few reports on bioterrorism in Japan and China. Nurses may not be prepared with the skills and knowledge needed to deal with such situations. Thus, nursing education should include coverage of the skills and knowledge needed to effectively respond to different disasters. Furthermore, there is an urgent need for education and training to improve nurses' preparedness and address global disparities (Songwathana & Timalsina, 2021). A previous study found that tabletop and operational exercise methods increased nurses' disaster readiness more effectively than lecture-based education (Aliakbari et al., 2022). In addition, a recent systematic review has shown that the number of disaster nursing education and training programs has gradually increased, and education and training methods have adopted a variety of approaches and technologies, such as a competency-based approach, an all-risk approach, an interprofessional approach, the use of flipped classrooms, the use of simulation and the use of virtual reality (Loke et al., 2021). Hence, the findings of this study provide evidence for the further development of disaster nursing education.

Earthquake rates are increasing worldwide (Abdi et al., 2021), and nurses play an important role in disaster response. Yin et al. (2011) identified knowledge of CPR as an essential skill that nurses to prepare for disasters. Nonetheless, Yan et al. (2015) suggested that in a real disaster situation, it is highly unlikely that CPR would be used to resuscitate the injured. Nurses' care in disaster areas is more likely to focus on caring for survivors rather than those who are critically ill and dying. CPR is the most basic first aid technique that should be mastered by nurses with or without disaster nursing training. Considering the regional differences, it is essential that disaster nursing training be developed specifically based on the characteristics of the concerned region and population to provide more insights for future disaster precision nursing. Earthquakes are one of the most destructive and dangerous natural disasters to the population, community and economy. Skilled nurses are critical in disaster response, and this study explores the skills that nurses need to possess for earthquakes and provides evidence for future disaster nursing training and disaster nursing curriculum development.

Typhoons and hurricanes are among the most devastating natural disasters on Earth and cause considerable property damage and casualties. Moreover, a previous study has shown that typhoons will

become more intense owing to climate change, which is expected to further increase the average typhoon intensity by an additional 14% by 2100 (Mei et al., 2015). Nurses should possess the professional knowledge and skills required for various rescue activities after a typhoon; however, this review found only one study on typhoon nursing skills from China and no studies on hurricane care skills. Most of the studies on typhoons have investigated typhoon disaster rescue skills training needs and influencing factors, and surveyed nurses' typhoon disaster relief work knowledge, attitude and skills survey (Cheng et al., 2014; Jiang et al., 2015). However, it remains unclear how typhoon nursing skills differ between countries. Timely and effective medical rescue measures play an important role in reducing casualties during typhoons. Therefore, scientific training and simulation exercises are needed to improve the disaster rescue capabilities of rescuers (Chaput et al., 2007).

Currently, there exist no practical guidelines that identify the clinical skills nurses need during the acute reaction phase following a tsunami. Regarding the knowledge and nursing skills related to tsunami disaster response, several previous studies (Lukthitikul & Hatthakit, 2007; Watcharong et al., 2005) reported that nurses did not have sufficient knowledge and nursing skills to provide wound care to patients affected by a tsunami. Studies have shown that wound inflammation and infection are related to the improper handling of wounds contaminated with debris, sand and mud. Almost all patients with wounds and open fractures experience infection-related complications. In terms of the nursing skills in tsunami wounds, a hospital in Banda Aceh, Indonesia has been providing tsunami wound care training and workshops for healthcare providers to improve their nursing clinical skills in tsunami wound care during the tsunami disaster response stage (Husna et al., 2011). In addition, Qin et al. (2014) have reported on nursing skills required amid China's marine disasters. In recent years, natural disasters, such as typhoons (hurricanes), shipwrecks, earthquakes and tsunamis, as well as various sea damages or man-made accidents, such as in relation to dense sea fog, icebergs, collisions, reefs, explosions and armed conflicts, have been increasing, showing that disasters occur instantly. These disasters characteristically cause many different types of severe wounds in a short period of time, and secondary organ damage caused by seawater is very likely to occur as the wound is soaked in the seawater. In addition, the particular geographical environment would be unique, the rescue environment is difficult, and the climate is harsh. Diversity, tight time and heavy tasks make it more difficult for such a scenario than for inland disaster rescue. Therefore, possession of tsunami nursing skills and professional training are essential.

In our review, we identified only one infectious disease for a natural disaster: COVID-19. Three studies from Spain and China reported on COVID-19 care skills. Studies have shown that most nurses lack experience in isolation wards and first aid training. Moura et al. (2021) reported contamination risk is a major concern affecting professionals involved in the care of COVID-19 patients. Nurses are exposed to very high risk during the clinical practice because they are the ones who spend the most time caring for patients. Therefore,

the correct use of personal protective equipment is very important for the safety of nurses. We also identified some infectious diseases, such as SARS and Ebola virus disease. Chen et al. (2009) investigated the relationship between the SARS crisis in 2003 and the degree of knowledge sharing and professional commitment. The results suggest that hospitals can increase the retention rate of medical staff by encouraging knowledge sharing, thereby enhancing professional commitment and reducing the impact of newly introduced infectious diseases. Holmgren et al. (2019) investigated the nurses' experience in health issues, teamwork and management experience of nurses during the Ebola epidemic in West Africa. The results show that most nurses experienced Ebola tasks in a positive way and need to transfer knowledge from experienced former representatives in a timely manner. Personal health management plays a crucial role in ensuring that nurses and their families feel safe. In addition, pre-deployment training helps to establish a common value base, which is necessary for future cooperation. However, these studies were excluded from our review because they did not involve nursing skills.

Two studies from Japan reported on nursing skills during radiation disasters, and after the JCO criticality accident in 1999, the number of publications in this area of research increased. However, the number dropped to a single digit 3 years later. Later, the number of publications increased sharply after the Fukushima Daiichi nuclear power plant accident in 2011, however, this number fell again 3 years later. Sasatake et al. (2017) reported that the emerging needs of nursing professionals include being equipped with knowledge and techniques for disaster management, which were identified from the experience of local accidents in nuclear power-related facilities and large-scale disasters. Many nurses participated in the management of the Fukushima Daiichi Nuclear Power Plant accident. They also participated in coordination with authorized personnel, providing psychological support to employees, and caring for the affected older, people with health problems, healthy people, young children and pregnant women. However, few studies have been conducted on the nursing skills in radiation emergencies, and the accumulated expertise is very limited. In addition, Yoshida et al. (2020) found that Japanese nursing students lacked knowledge about the management of radiation-related disasters in their undergraduate education. Hence, they showed greater fear of radiation-related disasters compared with American students. Thus, nursing students should receive adequate radiation education to reduce their fear and risk perception. The International Council of Nurses (ICN) Disaster Nursing Competency Framework (2009) has been disseminated worldwide, and disaster nursing education is reviewed based on this framework. However, the ICN disaster care competency framework does not include radiation disaster care. Therefore, we hope that the results of this study will encourage the further development of disaster nursing education.

Two studies from Italy and the United States reported on bioterrorism nursing skills. The clinical manifestations of different diseases caused by the diverse bioterrorism agents are often non-specific. Physicians or nurses are often the first healthcare providers to come into contact with a patient with an unusual

illness and therefore need to be knowledgeable enough to manage it appropriately (Nofal et al., 2021). All studies confirm that nurses are a vital part of the preparation for bioterrorism. However, most nurses have had no educational experience with bioterrorism. Rebmann and Mohr (2010) reported that the barriers to nurses receiving bioterrorism education mainly include the following four points: (1) 'no place to receive training', (2) 'no administrative and financial support', (3) 'no disaster drill ability' and (4) 'lack of psychological preparation against bioterrorism'. In addition, several studies (El-Monshed et al., 2021; Hasan et al., 2021) reported that nurses had limited skills for performing isolation and decontamination procedures as well as a lack of confidence in conducting health assessments and providing healthcare in the event of biological attacks or bioterrorism. Given the increase in terrorism and natural disasters over the past decade, public health challenges have continued to increase. Nursing leadership is critical for planning and responding to public health service targets. However, knowledge of bioterrorism has not been effectively disseminated in nursing courses or continuing education programs, and it is best to add new knowledge or skills to strengthen the existing disaster nursing courses (De Felice et al., 2008; Nofal et al., 2021). This study provides evidence for further training and innovation in bioterrorism nursing education. Furthermore, only one study from the United States focused on nursing skills related to war. Nurses play a critical role in reducing casualties, and nursing interventions are necessary during the first 72 h of casualty care (Wilson et al., 2022). Professional nursing skills are required due to the particularity of the type of injury. However, there has been little research on nursing skills related to war. Therefore, further training for nurses who have the potential to assist casualties is needed.

Regardless of when and where a disaster occurs, its impact on the population, community, and the economy can be catastrophic. According to a report by CRED (Guha-Sapir et al., 2017), there were four natural disasters that cost more than \$20 billion in 2016, which were floods in China, the Kumamoto earthquake in Japan, floods and Hurricane Matthew in the United States. 2020 Global Natural Disaster Assessment report (2021) has shown that in 2020, the frequency of flood disasters among the global natural disasters is the highest, accounting for 61.66% of the total. However, it was not possible to include research on the nursing skills required for flooding. Such works may have been published in other language journals or not published at all, and hence, these were not included in this review. Nonetheless, previous studies have shown that the intensity of extreme precipitation events and the risk of flooding may increase owing to global warming (Tabari, 2020). Extreme precipitation may increase the intensity and frequency of floods, which may increase the spread of infectious diseases, with heavy costs to aquatic and terrestrial ecosystems, human life and socio-economics (Editorial, 2021). Therefore, there is an urgent need for the global scientific community to disseminate more extensive knowledge and nursing skills on flooding to address the gap.

4.1 | Strengths

To increase the opportunity of incorporating the results of this scoping review into the body of existing practical evidence, the quality of the included Chinese, English and Japanese studies was independently assessed by two researchers. The strengths of this study include the use of robust and rigorous research methods and the identification of common and specific professional skills required for eight different types of disasters. Nurses' work experience is one of the factors influencing nurses' response to disaster nursing. Senior nurses have improved their clinical skills competencies with their rich experiences and knowledge in clinical practice, whereas less-experienced nurses have not accumulated enough experience, especially for complex problems and serious illnesses. But young nurses are proactive in learning to care for victims, so further education may improve disaster nursing skills. These findings provide more insights for better use of multiple disaster nursing education methods and technologies to achieve scenario-based precision simulation training programs and disaster precision nursing in the future.

4.2 | Limitations

Despite this study's strengths, however, some of its limitations must be acknowledged. First, this scoping review did not include grey literature, conference abstracts, comments, books or government documents. Secondly, this scoping review focused only on identifying the keywords in the study titles of retrieved studies, there may be other disaster nursing articles that may have been omitted since they do not include nursing skills. Thirdly, the review only included literature published in English, Chinese and Japanese; therefore, relevant literature published in journals in other languages was not included in this review. Finally, although the literature search included nurses across various levels, the majority of participants in the included studies were clinical nurses with a bachelor's degree. The included studies did not analyse the characteristics and skills of nurses. Thus, it was impossible to link the nurses' characteristics and nursing skills. To implement appropriate disaster nursing training, future studies need to further identify nurses' specific roles and specific skills. Despite these limitations, this review provides an insightful understanding of the essential disaster nursing skills that could be useful for future disaster nursing education.

5 | CONCLUSION

This scoping review explored the common and specific professional skills required for eight types of disasters and provides evidence for future disaster nursing education and training to improve nurses' knowledge and competencies in dealing with different types of disaster situations. Further research is needed to identify nurses'

specific roles and skills to devise more accurate training programs to provide more insights for future disaster precision nursing.

AUTHOR CONTRIBUTIONS

YS and YY: Design of the study and search strategy development. YS, NO and YY: Database searching and study selection. YS, XVW, NO and YY: Data extraction, analysis, synthesis and quality appraisal. Y.S.: First draft preparation. YS, XVW, NO, MY, HY and YY: Critical review of the manuscript and manuscript revision. YY: Study supervision. All authors reviewed the manuscript and approved the final version.

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CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

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