

# Disaster Nursing Competency of Intensive Care Nurses in Jinan, China: A Multicenter Cross-Sectional Study

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## ABSTRACT

**Background:** Patients in disaster areas require the most urgent assistance. In recent large-scale natural disasters, intensive care nurses have served as an important reserve component of disaster response teams. In disaster nursing, ability and attitude directly affect the quality and effectiveness of disaster rescues. However, few studies have examined the disaster nursing competency of intensive care nurses in China.

**Purpose:** This study was designed to describe the current status of disaster nursing competency among intensive care nurses, analyze the related factors affecting the disaster response effectiveness, and evaluate the values of disaster nursing continuing education and training in cultivating professional personnel with disaster emergency rescue competence.

**Methods:** This cross-sectional study was conducted at six tertiary general government hospitals in Jinan, Shandong Province, China. A convenience sampling method was adopted, and the Wenjuanxing website was used to compile the network questionnaire, which participants completed via a WeChat group. Descriptive, correlation, and regression analyses were performed using SPSS software.

**Results:** The participants in this study included 285 registered intensive care nurses employed at six hospitals in Jinan. Most were female (77.9%), and the mean age was 29.9 years. The mean total disaster nursing ability score was 122.98 ( $SD = 31.70$ ), and the average scores for each item ranged from 2.78 to 3.70. The incident command system item earned the highest mean score (3.70,  $SD = 1.22$ ), followed by triage (3.24,  $SD = 0.93$ ). The biological preparedness item earned the lowest mean score (2.78,  $SD = 1.04$ ). Being male, being < 30 years old, having an understanding of disaster nursing, having previously participated in disaster emergency simulation drills or training, and having a higher self-evaluation of rescue competence were all associated with higher disaster-nursing knowledge scores. Multiple linear regression analyses indicated that understanding of disaster nursing and experience participating in disaster emergency rescue drills or training had the most significant influence on the disaster nursing emergency knowledge score, followed by positive self-evaluation of disaster nursing ability and demand for training.

**Conclusions/Implications for Practice:** The findings of this study indicate that the participants had a moderate disaster-nursing competency and that this competency may be improved through disaster-related continuing education and training. The

cognitive attitude of disaster nursing was found to correlate positively with self-efficacy. Simulated emergency drills may effectively improve the disaster nursing competency of critical care nurses. The findings emphasize that experiences other than direct clinical practice such as specialized simulated emergency drills and training as well as willingness for such training are stronger factors for identifying and developing overall disaster nursing competency.

## KEY WORDS:

intensive care nurse, disaster, disaster nursing, competency.

## Introduction

Disaster nursing competency refers to the comprehensive knowledge, skills, and behaviors required by nurses to prepare for and respond to the real and potential threats of chemical, biological, radiation, nuclear, and hazardous explosion events; manmade accidents; natural disasters; and other related events (Slepski, 2005). As an indispensable team in disaster relief, nurses play an increasingly important role in disaster prevention, response, and victim recovery (Bongar et al., 2019). However, previous studies have shown that most nurses worldwide are not adequately prepared to deal effectively with disaster situations (Labrague et al., 2016). Only a few studies have addressed the question of effective disaster preparedness among nurses, underscoring the need for more research on this topic (Baker et al., 2019).

With disasters and public health emergencies occurring with increasing frequency, nurses comprise the largest healthcare workforce, and opportunities exist to strengthen

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disaster readiness, enhance national surge capacity, and build community resiliency to disasters (Chen et al., 2017). The best way to increase and maintain response capacity and ensure the sustainability of this capacity is through workforce development. Competency-based disaster nursing programs, standardized disaster curricula, training guidelines, and performance measures are required across all levels of nursing personnel (Tzeng et al., 2016). These competencies help ensure that every nurse has the foundational ability to respond at a basic level and keep themselves and their patients safe (Veenema, Griffin, et al., 2016). Only by mastering disaster care capabilities can nurses be full of hope, more confident, and more effective in dealing with complex and difficult disasters. Hope can be a life-sustaining force for all nurses and for those in their care (Persell, 2016). Intensive care nurses (ICNs), accounting for up to 45% of the medical retrograde rescue teams during the COVID-19 pandemic in Wuhan, China, played an important role in disaster and epidemic control (Wan, 2020). During small-scale disaster events, ICNs are involved mainly in the treatment of critically ill patients transferred to the hospital. During large-scale disaster events, ICNs are also dispatched to provide disaster relief assistance in the disaster area. At present, surveys of disaster preparedness have focused mostly on nurses or emergency department nurses, with little attention given to ICNs. The competency of ICNs in terms of disaster nursing ability is an issue that is not clear in the literature. Therefore, the purpose of this study was to explore the current situation of ICNs' disaster nursing competence and its influencing factors to provide a reference for related training improvement and a basis for future disaster rescue manpower allocation.

## Methods

### Study Design

A convenience sampling method was adopted in this study. With the assistance of the Shandong Provincial Nursing Association, the authors contacted head nurses in the intensive care units of six tertiary A general hospitals in Jinan. The head nurses organized their units' participation in the investigation after obtaining their consent, and 285 registered intensive care unit nurses from the six target hospitals were enrolled as participants. The study data were obtained using a survey published on the Wenjuanxing website ([www.wjx.cn](http://www.wjx.cn)), which is a questionnaire survey platform in China. This study was approved by the ethics committee of Qilu Hospital of Shandong University (No. KYLL-2019 [KS]-80), and informed consent was obtained from the participants, who were all volunteers.

### Participants

From June 11, 2019, to July 13, 2019, the 295 participants were selected using a convenience sampling method based on the following inclusion criteria: (a) being a registered nurse, (b) being currently employed in a hospital, and (c)

agreeing to participate. The exclusion criteria included (a) being an advanced nurse, (b) working on a rotating shift schedule, (c) being a student nurse, (d) not holding a nurse qualification certificate, (e) being on sick or maternity leave, and (f) submitting an incomplete questionnaire.

## Measurements

### Network questionnaires

The questionnaire used in this study collected the following information: demographic and personal details, including demographic data (age, gender, educational level, nurse level [N0–N4; see Supplementary Appendix A, <http://links.lww.com/JNR/A0>], and job title), as shown in Table 1, and professional status, as determined using yes/no answers to 10 variables, including “whether or not critical care specialist nurse,” “specialist nurse level,” “knowledge of disaster care,” “experiencing disaster events,” “disaster relief experience,” “participation in disaster relief drills,” “attendance at disaster nursing training sessions,” “level of the disaster nursing training,” “self-assessment of field disaster nursing ability,” and “willingness to train in disaster nursing.” Critical care specialist nurses have all received standardized professional training from national or provincial institutions and obtained the required qualifications. Specialist nurse level refers to the specialized nurse qualification granted by national or provincial institutions. Level of disaster nursing training usually refers to the training provided by national or provincial institutions.

### Nursing Disaster Emergency Knowledge Scale

The Nursing Disaster Emergency Knowledge Scale (NDEKS) is a self-assessment tool consisting of six summed variables (the 40 items are shown in Supplementary Appendix B, <http://links.lww.com/JNR/A1>), including “incident command system in disaster care”; “triage”; “communication”; “special care, isolation and decontamination”; “report and access to important resources”; and “biological preparedness.” Each item is measured using a 5-point Likert scale (1 = *absent* and 5 = *excellent*), with total possible scores ranging from 40 to 200 (Li et al., 2013), and higher scores correlated with better disaster emergency knowledge. Mean scores were classified as follows:  $\leq 2.99$ , poor; 3.0–3.99, moderate; 4.0–4.99, good; and  $\geq 5.0$ , excellent (Table 2).

The reliability and validity of the NDEKS were previously tested and shown to be adequate for the purposes of this survey (Li et al., 2013). In this study, the consistency of NDEKS was .92 (range of sum variables: .87–.98), indicating adequate reliability. The reliability and validity of this scale require further developing and testing.

### Data Collection

All of the assessments were completed by the researcher and a co-investigator. The Wenjuanxing website was used to compile the results of the online questionnaire. The link

**Table 1**

*Demographics and Scores of Disaster Nursing Knowledge of Participants, Compared Among Different Demographic and Professional Knowledge (N = 285)*

Category	n	%	M	SD	t/F	p
Gender					0.16	.002**
Male	63	22.1	133.90	31.28		
Female	222	77.9	119.88	31.19		
Age (years)			29.90	5.70	1.97	.021*
≤ 30	187	65.6	126.11	32.43		
31–50	98	34.3	117.02	29.49		
Highest degree					0.22	.881
Secondary	35	12.3	120.24	34.12		
specialized degree						
College degree	97	34.0	124.71	33.60		
Bachelor's degree	153	53.7	122.44	30.12		
Educational level					1.43	.235
College	12	4.2	128.45	16.12		
Bachelor's degree	262	91.9	122.34	32.06		
Master's degree	11	3.9	136.73	31.83		
Job title					0.39	.814
Registered nurse	111	39.0	125.47	34.49		
Nurse practitioner	127	44.6	121.63	29.25		
Supervisor nurse	43	15.1	129.65	45.64		
Associate professor of nursing	4	1.4	121.25	14.86		
Nurse level (years)					2.29	.079
N1 (< 2)	52	18.2	132.08	35.60		
N2 (2 to < 5)	111	39.0	122.17	29.70		
N3 (5 to < 10)	78	27.4	117.46	29.08		
N4 (≥ 10)	44	15.4	124.07	34.69		
Critical care specialist nurse					3.25	.201
Yes	112	39.3	119.71	28.06		
No	173	60.7	124.66	32.83		
Specialist nurse level (n = 98)						
Hospital	49	17.2	124.20	28.61	0.09	.767
Province	24	8.4	114.46	25.02	1.90	.169
National	25	8.8	118.56	23.51	0.53	.466
Understanding disaster care					2.36	.019*
Yes	139	48.8	127.48	33.90		
No	146	51.2	118.70	28.92		
Experienced disasters and types						
Yes <sup>a</sup>	53	18.6				
Flooding	17	6.0	123.29	34.73	0.00	.967
Fire	9	3.2	120.11	37.49	0.08	.783
Epidemic disease	13	4.6	125.31	35.05	0.07	.787
Earthquakes	12	4.2	115.00	25.48	0.79	.374
Bomb blast	7	2.5	129.86	42.30	0.34	.562
Tsunami	4	1.4	111.00	39.64	0.58	.447

(continues)

**Table 1**

*Demographics and Scores of Disaster Nursing Knowledge of Participants, Compared Among Different Demographic and Professional Knowledge (N = 285), Continued*

Category	n	%	M	SD	t/F	p
Road traffic accident	26	9.1	133.19	38.35	2.99	.085
Unspecified	19	6.6	131.19	19.50	1.48	.225
No	232	81.4	121.68	31.46	2.07	.151
Disaster relief experience						
Yes <sup>a</sup>	29	10.18				
Flooding	3	1.05	119.00	14.73	0.05	.827
Fire	1	0.35	123.00	0.00	0.00	1.000
Epidemic disease	5	1.75	127.40	37.42	0.89	.754
Earthquakes	2	0.70	105.50	7.78	0.61	.435
Bomb blast	2	0.70	143.00	9.90	0.80	.371
Road traffic accident	8	2.81	142.50	36.75	3.15	.077
Unspecified	13	4.56	127.77	15.58	0.31	.578
No	256	89.82	122.30	32.18	1.18	.279
Participation in disaster relief drills					1.70	.002**
Yes	116	40.70	129.97	32.73		
No	169	59.30	118.19	30.13		
Attend disaster nursing training					5.2	< .001**
Yes	133	46.67	130.09	33.56		
No	152	53.33	116.76	28.66		
Disaster nursing training level <sup>a</sup>						
Department level	104	36.49	126.02	28.91	1.51	.210
Hospital level	101	35.44	130.38	32.26	8.75	.003**
Municipal level	6	2.11	155.83	26.54	6.72	.010*
Provincial level	15	5.26	135.80	48.08	2.60	.108
National level	11	3.86	148.91	38.41	7.84	.005**
Unspecified	105	36.84				
Self-assessment of on-site disaster nursing ability					15.00	< .001**
Highly competent	69	24.21	138.52	31.58		
Mildly competent	152	53.33	121.30	28.58		
Not competent	64	22.46	110.22	32.52		
Necessity for disaster care training					2.93	.021*
Very unnecessary	9	3.16	128.33	24.59		
Unnecessary	4	1.40	116.75	29.07		
No opinion	24	8.42	114.67	24.42		
Necessary	155	54.39	118.95	30.82		
Very necessary	93	32.63	131.59	34.01		

<sup>a</sup> Multiple choice.\* $p < .05$ . \*\* $p < .01$ .

**Table 2**  
*The Average Total Dimension Scores for Disaster Nursing Ability*

Rank	Item	No. of Entry	Total Scores		Mean Scores	
			Mean	SD	Mean	SD
1	Incident command system in disaster care	7	25.87	5.97	3.70	1.22
2	Triage	5	16.22	4.65	3.24	0.93
3	Communication	7	21.03	6.35	3.00	1.01
4	Special care, isolation and decontamination	15	42.51	13.29	2.83	1.03
5	Report and access to important resources	3	9.01	2.86	3.00	1.01
6	Biological preparedness	3	8.34	2.93	2.78	1.04
	Total items		122.98	31.70	3.75	1.09

address corresponding to the online questionnaire was sent to the head nurses of the intensive care unit of the six hospitals, and the purpose, content, method of completion, and survey precautions were explained. After obtaining the consent of the participants, the questionnaires were allocated to the head nurses in each intensive care unit in batches. The head nurse of each intensive care unit then sent the link address to the WeChat group, and the participants completed the questionnaire. A unified instruction language was used in the questionnaire, which could not be submitted until all of the questions were answered. Submissions of the questionnaire were done anonymously and voluntarily, and completion took less than 15 minutes.

At the end of the survey, completed questionnaires were assessed to eliminate data that did not meet the inclusion criteria. All valid data were then downloaded into the IBM SPSS Statistics 22.0 software program (IBM Inc., Armonk, NY, USA) for analysis.

**Data Analysis**

IBM SPSS Statistics 22.0 was used for data processing. The total score of disaster nursing ability of ICNs was divided by the six dimensions. Disaster nursing knowledge scores were compared in terms of demographic and professional status. Descriptive analysis was performed first, with results described by category using frequencies and percentages. The measured data were represented by mean and *SD*. Intergroup comparisons were performed using direct testing or one-way analysis of variance. Multivariate linear regression analysis was used to assess the factors influencing the participants' knowledge score, with  $p < .05$  considered statistically significant.

**Results**

**Demographic and Professional Information**

Two hundred ninety-five questionnaires were issued and collected. Ten questionnaires were invalidated, leaving data from 285 valid questionnaires available for data analysis (recovery rate: 96.6%). The average time taken to complete the

questionnaire was 6.18 minutes. Of the 285 participants, 222 were female and the average age was 29.9 ( $SD = 5.7$ ) years. Two hundred seventy-three held bachelor's degrees or higher (95.8%), and 47 (16.5%) held middle or senior professional titles. Moreover, 122 were senior (including N3 and N4) nurses (42.8%). A detailed demographic description of the sample is provided in Table 1.

**Disaster Nursing Ability Score**

As shown in Table 2, the mean total score was 122.98 ( $SD = 31.70$ ), whereas mean item scores ranged from 2.78 to 3.70 (mean =  $3.75 \pm 1.09$ ). Of the six items, incident command system earned the highest mean score (3.70,  $SD = 1.22$ ), followed by triages (3.24,  $SD = 0.93$ ), whereas biological preparedness earned the lowest mean score (2.78,  $SD = 1.04$ ).

**Comparison of Disaster Nursing Knowledge Scores Among Participants of Different Demographic and Professional Backgrounds**

The scores for disaster nursing knowledge, which are used to measure disaster nursing ability, were compared among the 285 participants. No statistical difference was found in terms of “educational level,” “job title,” “critical care specialist nurse,” and “experienced disasters and types” ( $p > .05$ ). However, significant differences were found between the two groups “male or female,” “less than 30 years or 30–50 years,” “understanding disaster care or not,” and “participate in disaster relief drills or not” ( $p < .05$ ). The average scores of senior professional nurses were significantly higher than those of junior professional nurses (nurses and nurse practitioners;  $p < .05$ ). Of note, the scores of N1 level nurses were significantly higher than those of N3 level nurses ( $p < .05$ ). When assessing continuing education and training of disaster nursing knowledge at different levels, the training scores of the participants who participated in hospital-level, city-level, or national training were significantly higher than



those who had participated in provincial training ( $p < .05$ ). Furthermore, the disaster nursing knowledge scores of nurses holding a positive self-evaluation of their nursing ability and training willingness were substantially higher than those with negative self-evaluations of the same ( $p < .05$ ; Table 1).

## Multiple Linear Regression Analysis of Disaster Nursing Ability

Multiple linear regression was used to examine how the several independent variables (gender, age, understanding disaster nursing, participation in disaster relief and emergency drills, self-assessment of on-site disaster nursing ability, and willingness to receive training) related to one dependent variable (disaster-nursing emergency knowledge score). The inclusion criterion was .05, and the exclusion criterion was .10. The results of the multiple linear regression analysis showed “understanding disaster nursing,” “participating in disaster relief and emergency drills,” “receiving different levels of training,” “self-assessment of on-site disaster nursing ability,” and “willingness to receive training” to significantly affect disaster emergency knowledge scores ( $R^2 = .84$ ,  $p < .01$ ; Table 3).

## Discussion

In this study, a self-assessment-based NDEKS was used to investigate the current situation in China regarding the disaster nursing competence of ICNs and related variables. The disaster nursing competency of ICNs was found to be below average. In addition, understanding of disaster nursing and experience in disaster emergency rescue drills and training were, together with positive self-evaluation of disaster nursing ability and demand for training, the variables found to most significantly affect the disaster-nursing emergency knowledge score.

## Current Situation of Disaster Nursing Ability of Intensive Care Personnel

Nurses who work in emergency departments, intensive care units, and operating rooms are important participants in the provision of medical services after disasters (Levoy et al., 2018). With the development of critical care medicine, countries worldwide now attach great importance to the development and use of intensive care medicine to support and implement disaster relief.

Prior studies have revealed that nurses are not well sufficiently prepared for disasters and are not aware of disaster management protocols in the workplace (Labrague et al., 2016; Liu et al., 2009; Taghizadeh et al., 2017). In one study in the Philippines, 80% of nurses were unprepared for disasters (Labrague et al., 2016). In addition, an Iranian study indicated that 86.8% of nurses required training in disaster care (Taghizadeh et al., 2017). Liu et al. indicated that, in China, 96.8% of nursing personnel were in need of education related to handling disaster situations (Liu et al., 2009). Disaster-related uncertainties and sensory impacts increase the risk of developing mental health conditions such as stress disorder, depression, and anxiety (Benedek et al., 2007). Disaster preparedness is critical for nursing staff to stave off the potentially heavy social and psychological burdens caused by the need to deal with multiple problems in a rapidly changing, uncontrolled, and potentially dangerous disaster environment and to balance professional and personal needs successfully (Raveis et al., 2017).

The participants in this study earned a mean total score of 122.98 ( $SD = 31.70$ ), which was lower than in a similar study conducted by Li et al. (129.91 [ $SD = 28.70$ ]). The average score for each item was 3.75 ( $SD = 1.09$ ), indicating a “moderate” level of disaster nursing competency (Li et al., 2013). In addition, 95.44% of the participants expressed a desire for training opportunities, with 87.02% expressing a

**Table 3**

*Multivariate Regression Analysis of Disaster Nursing Ability Score*

Factor	Unstandardized Coefficient		Standardized Coefficient	<i>t</i>	<i>p</i>
	<i>B</i>	<i>SE</i>	$\beta$		
Constant	51.986	16.98		3.06	.002*
Gender	2.06	1.83	0.003	0.14	.887
Age	0.36	0.45	0.065	0.80	.424
Understanding disaster nursing	3.06	1.45	0.048	2.12	.035*
Participation in disaster relief and emergency drill	7.99	1.32	0.254	6.06	.000**
Attending relevant theory training	0.30	1.52	0.005	1.99	.843
Receiving different levels of training	8.35	1.39	0.265	6.00	.000**
Self-assessment of on-site disaster nursing ability	3.36	1.34	0.105	2.51	.013*
Willingness to receive training	11.99	1.14	0.384	10.53	< .001**

Note.  $R^2 = .84$ ,  $F = 282.53$ ,  $p < .01$ .

\* $p < .05$ . \*\* $p < .01$ .

“strong” desire. Although the knowledge and education of nurses are substantially improved over previous years (Li et al., 2013), nurses in intensive care units still have a higher training demand for improving their ability in disaster nursing. Therefore, institutions and directors of nursing education should improve nursing training methods to strengthen multidisciplinary knowledge and skills in disaster nursing training through annual training exercises and continuing education (Veenema, Losinski, & Hilmi, 2016).

The disaster nursing knowledge scores for disaster nursing ability items, from high to low, were “incident command system in disaster care”; “triages”; “report and access to important resources”; “communication”; “special care, isolation and decontamination”; and “biological preparedness.” “Incident command system in disaster care” and “triages” earned the highest scores, which was similar to the results of other studies (Li et al., 2013; Veenema, Losinski, & Hilmi, 2016). The target hospitals of this survey were large-scale tertiary general hospitals, which pay more attention to the organization of the emergency medical team and to recruiting nursing staff with higher levels of education, higher professional titles, and richer management experience. Knowledge of triage practices may be learned and consolidated in the course of daily work and training.

However, because daily work offers little opportunity for hands-on experience with “special care, isolation and decontamination” and to learn about biological agents, scores in these areas were lower. However, the items “special care, isolation and decontamination” and “biological preparedness” were also found to be important to stronger disaster training because of ICNs’ intervention in disaster nursing mainly after being transferred to the hospital. Although hands-on experience is not applicable to the above two items, simulation training may play an important role in disaster training. Because nursing at disaster relief sites differs from intensive care nursing settings in hospitals, we recommend the use of computer-based virtual simulation drills, case-study drills for treating injuries in different types of disasters, and different scenarios and functional modules in different periods to familiarize nurses with disaster rescue scenes. In addition, simulations can help analyze, rectify, and improve the achievement of overall drill outcomes both during and after drills. Multidisciplinary disaster training and education should be provided to nurses of different levels, and the training outcomes of simulated drills should be monitored through regular assessments of self-efficacy (Park & Choi, 2020). In addition, computer-based simulation drills provide opportunities for head nurses to improve management skills and increase self-efficacy (Jonson et al., 2017).

## The Influence of Demographic and Professional Characteristics on Disaster Nursing Emergency Knowledge

The results of this study revealed that factors including educational level, job title, critical care specialist nurse, and experienced disasters and types did not significantly influence

the results, indicating that nursing education is not the fundamental variable determining ability in disaster nursing. Rather, systematic professional continuing education and retraining are much more important to improving disaster nursing abilities. Moreover, daily nursing experience cannot adequately prepare ICNs for disaster nursing. Thus, for most nurses, disaster nursing preparedness remains inadequate.

Statistically significant differences were found in terms of gender, age, understanding disaster care, and participation in disaster relief drills between the two groups. The male participants earned significantly higher disaster nursing ability scores than their female counterparts ( $p = .002$ ), providing guidance in allocating disaster nursing manpower. Moreover, the disaster nursing ability of nurses younger than 30 years old was much higher than that of older nurses ( $p = .021$ ), which is likely correlated with the increased attention now given to disaster nursing education in colleges and universities. Most older ICNs have not received any formal education in disaster nursing, and their knowledge of nursing may not be up-to-date. Thus, older nurses should benefit most significantly from on-the-job continuing education to cultivate greater capabilities in disaster nursing.

Of note, the scores of senior professional nurses were significantly higher than those of junior professional nurses (nurses and nurse practitioners;  $p < .05$ ). These findings indicate that nursing personnel with senior professional titles in critical care have a firmer grasp of the relevant skills and knowledge, and a wide range of knowledge, which reflects the consistency of comprehensive ability and practical work requirements in critical care. In addition, N1 level nurses earned significantly higher scores than their N3 level counterparts ( $p < .05$ ). These results suggest that daily workplace experience alone, in the absence of continued training to refresh and update professional knowledge, does not increase professional disaster nursing capabilities in middle and senior nurses.

When assessing the continuing education and training of disaster nursing knowledge at different levels, the training scores of those who participated in training at the hospital, city, or national level were significantly higher than those who had participated in provincial-level training ( $p < .05$ ). These results indicate that standardized hospital-level training, with lower costs, may obtain the most optimal outcomes in terms of improving disaster nursing ability. Intensive care personnel who receive training in disaster nursing theory and simulation drills can further consciously strengthen their professional disaster nursing and rescue capabilities (S. Smith et al., 2015). Moreover, the results of the multiple linear regression analyses indicate that knowledge of disaster nursing, participation in disaster nursing emergency drills, previous disaster nursing training at different levels, self-evaluation of on-site disaster nursing ability, and willingness to participate in disaster nursing training are the most important variables affecting knowledge acquisition. Furthermore, the disaster nursing knowledge scores of the participants with positive self-evaluations of their nursing ability and training willingness were significantly higher than those

with negative self-evaluations ( $p < .05$ ). Values and interests with a positive sense of professional self-efficacy were shown to stimulate work initiative and potential. Thus, it is important for nurses to recognize and take part in disaster education/training as an essential component of their work, which is consistent with the results of previous studies (Shinners & Africa, 2020; Uhm et al., 2019).

ICNs are a key reserve team in disaster nursing rescue. Although ICNs possess the theoretical skills of critical care and know how to use medical instruments, their disaster nursing emergency knowledge was shown in this study to be inadequate, with participants having only a moderate level of knowledge regarding how to address disaster emergencies. Nursing directors and educators must constantly strengthen the methods of disaster emergency training, improve the continuing education support system of disaster nursing, and implement simulation training based on theoretical education (Jonson et al., 2017; Shinners & Africa, 2020; S. Smith et al., 2015; Uhm et al., 2019; Usher et al., 2015). Nursing directors and educators should also be encouraged to participate in practical rescue operations, give priority to training in special disaster nursing knowledge that is seldom used in clinical nursing, and improve the emergency treatment capabilities of nurses. We recommend establishing disaster nursing professional certification training education and incorporating this training into standard nursing education. We also suggest that disaster nursing should conduct cross-disciplinary training to meet the complex needs of disaster nursing (Chan et al., 2020; Mancini et al., 2019; S. J. Smith & Farra, 2016).

## Conclusions

In conclusion, the findings of this study indicate that ICNs have a moderate level of disaster nursing competency. However, this situation may be improved through disaster-related continuing education and training, preferably conducted at the hospital. Cognitive attitude toward disaster nursing was shown to relate positively to self-efficacy. In addition, simulated emergency drills may effectively improve disaster nursing competency in critical care nurses.

## Relevance to Clinical Practice

The disaster nursing ability scale may be used to identify the level of disaster competence and educational needs of nurses in future disaster roles. Further research is needed to address the minimum requirements for competency in disaster relief to develop a sustainable recruitment profile of qualified future disaster relief nurses. The findings of this study also show that experiences other than direct clinical practice such as specialized simulated emergency drills and training and willingness to participate in this training are highly significant factors for identifying and developing overall disaster nursing competency.

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## Author Contributions

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The authors declare no conflicts of interest.

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