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Original Article

Emergency response ability training of nursing students in the emergency department under COVID-19 epidemic situation-expert consensus of evidence-based practice and Delphi method

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Abstract: Objective: To construct standardized training procedures and measures for emergency nursing students in COVID-19 epidemic setting so as to improve their ability to deal with emergencies. Methods: A total of 75 nursing students who were interns in the emergency department of Lu'an People's Hospital of Anhui Province from August 2021 to July 2022 were prospectively selected. Based on the evidence-based methodology and Delphi method, the best evidence for improving the emergency ability of nursing students in emergency department was obtained by systematically retrieving databases such as Web of Science, Cochrane Library and China Knowledge Network. Through two rounds of Delphi expert consultation and consulting experts' opinions, the training plan for emergency ability of nursing students in emergency department under COVID-19 epidemic situation was finally determined, and the effect of the training plan after its implementation was evaluated. Results: The scores of prevention ability, preparation ability and rescue ability of nursing students increased after training ($P<0.05$). After training, the nursing students' humanistic care ability, theory test score, operation skill score and condition grading ability score also increased ($P<0.05$). Additionally, task analysis, self-motivated belief, self-evaluation, self-monitoring and regulation, and total score of nursing students all increased after training ($P<0.05$). The scores of each dimension in the Chinese Version of Critical Thinking Disposition Inventory (CTDI-CV) scale after training were higher than those before training ($P<0.05$). Moreover, after training, the correct rate of nursing students' cognition on hospital epidemic prevention and control and the patients' total satisfaction degree to the nursing students' diagnosis and treatment services both increased ($P<0.05$). Conclusion: The content of the training program for emergency ability of nursing students in emergency department under the COVID-19 epidemic based on the expert consensus of evidence-based and Delphi method was reliable and practical, which helped to improve the emergency ability of nursing students and the correct understanding of the hospital epidemic prevention and control, fully inspired the active learning ability, and enhanced the humanistic care ability and operational skills, and the patient satisfaction was high.

Keywords: Evidence-based methodology, Delphi letter inquiry method, COVID-19 epidemic, nursing students in emergency department, emergency capacity, training scheme

Introduction

COVID-19, with the characteristics of fast transmission, strong infectivity and wide transmission range, has been listed as Class B infectious disease by the *Law of the People's Republic of China on the Prevention and Control of Infectious Diseases*, and managed as Class A infectious disease [1, 2]. As required by China's National Training Program for Health Emergency Response Work, health administrative departments at all levels shall regularly organize emergency drills in medical and health institutions and train medical staff in emergency handling skills and knowledge to comprehensively enhance the ability to prevent and respond to public emergencies. The emergency department is the most crucial frontline in the prevention and control of COVID-19 epidemic, and the training of nursing team on emergency response ability needs to be strengthened [3].

In the fight against COVID-19 in early 2020, approximate 30,000 nurses rushed to Wuhan City, accounting for approximate 2/3 of all medical staff, which took a mainstay part in the overall fight against the epidemic [4]. Nurses constitute a professional group with the closest contact with patients and the largest proportion, so their professional knowledge, emergency handling ability, communication ability and clinical practising skill are particularly critical in reducing nosocomial infection and improving rescue quality [5]. The nursing students are the important reserve force of the hospital nurses, and their comprehensive nursing ability is closely correlated with the overall progress and coordinated development of the nursing work. However, a survey on the core competence of nursing students in the emergency department shows that most of nursing students lack systematic and professional emergency rescue training, and their emergency rescue ability is thus obviously insufficient [6]. Thus, finding a way to establish a set of comprehensive training programs with clear orientation and scientific norms is greatly important in improving the emergency response ability of nursing students in the emergency department and reducing the damage of public health emergencies. Currently, the research on public health emergencies such as COVID-19 at home and abroad mostly focuses on the emergency management and epidemiological investigation of related institutions, and there are few reports on nursing students' ability in coping with emergencies [7]. Accordingly, based on the expert consensus of evidence-based practice and Delphi method, this study constructed a standardized training process and measures for emergency response ability of emergency department nursing students in the context of COVID-19 epidemic, with the purpose of providing reference for the training of nursing students.

Data and methods

Research objects

In this prospective study, a total of 75 nursing students who worked as intern in the emergency department of Lu'an People's Hospital of Anhui Province from August 2021 to July 2022 were selected, including 2 males and 73 females with an age of 19 and 23 years (mean age: (21.03±1.18) years). Among them, 34 were with junior college degree and 41 with bachelor's degree or above.

Inclusion criteria: Students studying in the emergency department; students taking nursing courses and examinations in hospital emergency department; and students who signed informed consent form voluntarily. Exclusion criteria: Students who had participated in a nursing intership or worked in an emergency department before; students who dropped out of school; students who did not cooperate with questionnaire filling and intervention. This study was conducted with permission from the Medical Ethics Committee of Lu'an People's Hospital of Anhui Province.

Methods

Establishment of a core emergency group

A group consisting of an attending physician, a deputy chief physician, a ward head nurse, two nurses in charge, and two nurses was established, with the head nurse as the group leader. The group leader led the team members to search domestic and foreign literature, draw up consultation items, select consultation experts, and then summarize, revise and analyze the consultation results of each round to form the next round of consultation questionnaire, and finally determine the emergency ability training program for nursing students in the emergency department. The program was determined by the expert committee after discussion. Finally, the training program for nursing students on emergency coping ability was discussed and determined by the expert committee after discussion.

Preliminary consultation items

Search strategy: The members were arranged to search four English databases, namely PubMed, Embase, Web of Science and Cochrane Library, and four Chinese databases, namely China knowledge Network, Wanfang Data, VTTMS and China Science and Technology Journal Database (VIP), with the key words including "COVID-19 epidemic situation", "nursing students in the emergency department", "emergency response ability", and "training program", without language restriction. The time limit was set up to May 2022 in research.

Table 1. Coordination degree of two rounds of experts consultation

Round	First-class index	Second-class index	Third-class index	Coordination coefficient	χ^2	*P*
The first round	4	10	27	0.398	200.362	<0.001
The second round	4	11	29	0.421	121.053	<0.001

If a study has multiple publications, the latest one was adopted. In the case of updated or repetitive literature, the literature with the best quality and the most comprehensive information was selected. Literature types included reviews, expert consensus, and guides, while literatures such as comments, case reports, and animal studies were excluded.

Search results: A total of 256 related articles were screened out for the first time. Among them, 28 repetitive and irrelevant articles were excluded, and 155 articles were excluded after reading abstract and topic; 68 articles were excluded based on full-text reading. Finally, 5 articles met the criteria, including 2 guides, 2 English reviews and 1 systematic review, which included 2 summaries of the best evidence [8, 9].

Delphi method

Experts on correspondence

A total of 18 experts were included, all of whom were engaged in emergency department training, nursing management and clinical work in tertiary hospitals in China. There were 6 males and 12 females between 39 and 57 years old (mean age: (44.63±3.32) years), with working duration of 10-32 years (mean working duration: (27.63±4.45) years). Additionally, the experts consisted of 5 experts with bachelor degree, 9 experts with master's degree, and 4 experts with doctoral degree, and included 4 experts with medium-grade professional title and 14 experts with senior (deputy) professional title.

Positive coefficient, authority degree and coordination degree of experts

In the first round, 18 questionnaires were distributed and 17 were recovered, showing an effective recovery rate of 94.44% (>70%). In the second round, 18 questionnaires were also distributed, and 16 were recovered, showing an effective recovery rate of 88.89% (>70%). Therefore, the enthusiasm of experts was high. The expert authority coefficient (Cr) of the first and second rounds of consultation experts was 0.824 and 0.835, respectively, indicating the high expert authority degree. Note: authority coefficient (Cr) = [expert judgment coefficient (Ca) + expert familiarity coefficient (Cs)]/2. The coordination coefficient of the two rounds was 0.398 and 0.421, respectively, and the coordination coefficient of the second round was obviously improved, which indicated that the second-round program was more recognized by experts. The inquiry was terminated after two rounds (**Table 1**).

Correspondence process

Based on the best evidence and the actual clinical situation in China, the first round of consultation covered 4 first-class indexes, 10 second-class indexes and 27 third-class indexes. Seven experts (38.89%) put forward 5 pieces of suggestions on amendments, mostly concentrated in the second and third-class indexes, specifically: (1) Experts indicated that the simulation scenario of public health emergencies was particularly critical in the training program, so they suggested to add "simulation scenario" as the third-class indicator; (2) Experts suggested that prevention ability should be listed as the second-class index, separately, and three third-class indexes should be set up: Specimen prevention and disinfection and isolation of infectious diseases, hospital infection prevention and disinfection system and measures, and graded prevention and personal protective equipment usage. (3) The content of "law-related knowledge" in basic knowledge was duplicated with "ethics and law" in preparation ability, so it was suggested to be removed; (4) The second-class indexes of management ability "communication ability" was duplicated with the contents of "mental health maintenance, stress and stress response, humanistic care and service" in emergency response ability, so it was suggested to be removed; (5) Patients in the emergency depart-

ment are often accompanied by complications, so it was suggested to add the "timely evaluation and treatment of complications" as the three-class index. After the second round of expert consultation, the first-class index was kept unchanged; two third-class indexes were removed; four third-class indexes and one second-class index were added. Finally, a set of emergency response training program for nursing students in the emergency department was determined. The theoretical guide of basic knowledge includes the Technical Selection of Cases for Hospital Isolation issued by the Ministry of Health in 2020, and the guidelines for COVID-19 include Nursing Standards for Severe and Critically Ill Patients with COVID-19 (National Health Office Medical Han [2020] No. 170) released on March 1, 2020, Diagnosis and Treatment Protocol for COVID-19 (Trial Version7) (National Health Office Medical Han [2009] No. 184) released on March 3, 2020, and so on (**Table 2**).

Outcome measures

(1) Core emergency response ability of nursing students. The questionnaire consisted of 33 items in three dimensions: preparation (4 items), rescue (26 items) and prevention (3 items), that is, rescue included five second-class indexes: risk communication, public health response, medical response, reporting and monitoring; preparation included two indexes: laws and regulations and emergency plan and with 1-5 points for each item and 33-165 points for the total, and prevention ability includes 1 indicator, basic knowledge. The Cronbach's α coefficient of the questionnaire was 0.845 and the validity was 0.796. (2) Humanistic care ability. The questionnaire consisted of 20 items in 8 dimensions: providing a good environment, scientifically solving health problems, promoting emotional communication, instilling faith and hope, forming the values of humanity and separation from others, helping to meet basic needs, health education and helping to solve difficulties. Each item was given 1-5 points, with a total score of 20-100 points. The ability of humanistic care was positively correlated with the score. The Cronbach's α coefficient of the questionnaire was 0.799 and the validity was 0.825. (3) Theoretical test scores and operational skill scores. The theoretical examination was conducted in the form of a closed book, with a total score of 100 points, and the questions were from the question bank. The total score of practice assessment was 100 points, covering ventilator use, cardiopulmonary resuscitation, tracheal intubation and other common emergency department operations, all of which were assessed on site by the same group of invigilators. The self-made scale covered 10 emergency simulation cases, with a full score of 10 points, and a correct one was given 1 point. A higher score suggests better theoretical and operational skill. The Cronbach's α coefficient of the questionnaire was 0.712 and the validity was 0.843. (4) Active learning ability. The scale covered 34 items in four dimensions: self-evaluation, task analysis, self-motivation belief, self-monitoring and regulation. A higher score suggests better active learning ability. The Cronbach's α coefficient of the questionnaire was 0.821 and the validity was 0.786. (5) Critical thinking ability of nursing students was assessed by Chinese version of critical thinking disposition inventory (CTDI-CV) [10] which covered 70 items in 7 dimensions, and each item was given 1-6 points, with a total score of 70-420 points. The critical thinking ability was positively correlated with the score. (6) Awareness of epidemic prevention and control in hospitals. A questionnaire was developed by referring to guidelines including Circular of the General Office of the National Health Commission on the Guidelines for the Use of Disinfectants, Discussion on the Common Perplexity in the Prevention and Control of COVID-19 Hospital infection, and COVID-19 Prevention and Control Plan. The questionnaire included "do you think it is necessary to perform hand hygiene operation after taking off each layer of protective equipment" (correct answer is yes), "do you think it is better to wear as much protective equipment as possible" (correct answer is no), "do you think it is necessary to spray with disinfectant before taking off protective equipment" (correct answer is no), "do you think hospitals need to disinfect places where patients stay for a short time" (correct answer is no), "do you think the hospital needs to air disinfect the outdoor environment" (the correct answer is no). (7) Patient satisfaction. At the time of discharge, a self-designed questionnaire was services was evaluated from the aspects of professional quality, service attitude and humanistic care.

Table 2. Training program for nursing students on emergency ability in the emergency department

First-class index	Second-class index	Third-class index	Class hour	Form	Target
1. Basic knowledge of COVID-19	1.1 basic knowledge theory of COVID-19	1.1.1 Basic knowledge, guidelines and programs, emergency policies and principles of COVID-19	1	Online teaching video viewing+on-site explanation	To have oral basic theoretical knowledge and nursing professional knowledge
		1.1.2 Common safety and health risks in COVID-19 and emergency treatment measures in the case of exposure	1		
	1.2 COVID-19 response practice ability	1.2.1 Simulation scenario	1	Online teaching video viewing+on-site explanation	
		1.2.2 Man-machine dialogue in handling COVID-19	1		
2. Emergency response ability	2.1 Prevention ability	2.1.1 Specimen prevention and disinfection and isolation of infectious diseases	2	Online teaching video viewing+on-site explanation+teaching	To have ability to perform standardized operation
		2.1.2 Hospital infection prevention and control disinfection system and measures	2		
		2.1.3 Graded prevention and use of personal protective equipment	2		
	2.2 Preparation ability	2.2.1 Ethics and law	1	Reading materials	To have ability to perform dictation
		2.2.2 Emergency materials management methods	1		
	2.3 Rescue ability	2.3.1 Ability to cooperate with doctors	2	Online teaching video viewing+on-site explanation+teaching	To have ability to perform standardized operation
		2.3.2 Mastery and application of common rescue techniques	2		
		2.3.3 Monitoring and reporting of COVID-19	1		
		2.3.4 On-site risk assessment and graded response to public health events	1		
		2.3.5 Mental health maintenance, stress and stress response, humanistic care and service	1		
		2.3.6 Specimen collection of patients with infectious diseases	2		
		2.3.7 Infectious medical waste treatment and corpse care	2		
3. Critical thinking ability	3.1 Evaluation and foresight ability	3.1.1 Correct diagnosis according to the patient's condition	1	Online teaching video viewing+on-site explanation+teaching	To have ability to perform standardized operation, independent emergency knowledge and skill system, and critical thinking
		3.1.2 Correct analysis of the condition according to the patient's vital signs	1		
	3.2 Analysis and judgment ability	3.2.1 Evaluation and handling of complications in time	1		
		3.2.2 Accurate assess of the potential risk factors of patients	1		
4. Management ability	4.1 Emergency personnel deployment ability	4.1.1 Cooperation with the deployment of nursing staff in the department	1	Reading materials+on-site explanation	To have ability to perform standardized execution, management and teamwork
		4.1.2 Participation in second-line nursing duty	0.5		
	4.2 Ability to deal with crisis	4.2.1 Treatment of disputes between patients and nurses	0.5	On-site explanation+teaching	To have ability to perform standardized operation, handling of all kinds of emergencies with ease
		4.2.2 Mastering and application of emergency plan	0.5		
		4.2.3 Prevention of nursing safety	0.5		
	4.3 Ward management ability	4.3.1 Environmental management	0.5	Materials reading	To have ability to perform standardized management of ward environment and equipment, etc.
		4.3.2 Equipment Management	0.5		
	4.4 Coordination ability	4.4.1 Coordination among various departments in the whole hospital	0.5	Materials reading	To have ability to perform standardized execution and coordinate
		4.4.2 Allocation of various rescue instruments	0.5		

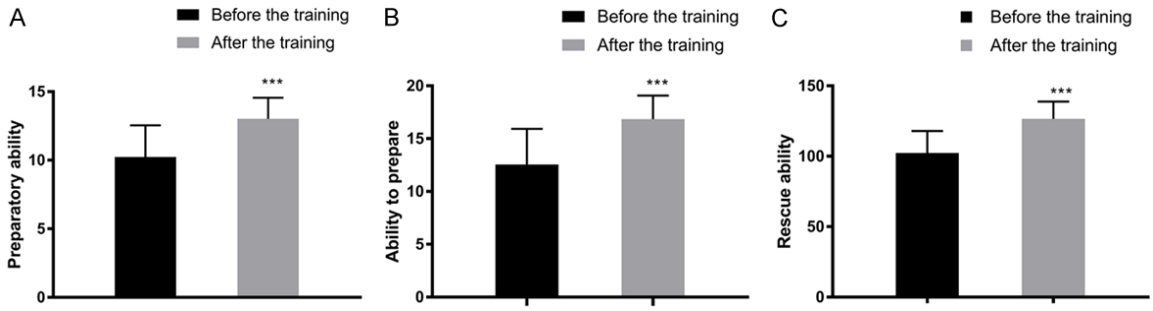

Figure 1. Comparison of core emergency response ability of 75 nursing students before and after the training. Notes: (A) The preparatory ability of students increased after the training, ***P<0.001; (B) The prevention ability of students increased after the training, ***P<0.001. (C) The rescue ability of students increased after the training, ***P<0.001.

Statistical analyses

All statistical analyses were conducted via SPSS 21.0. The measurement data ($\bar{X}\pm S$) were compared within groups using the Paired sample t test, and counting data (%) were analysed using χ^2. P<0.05 suggested a notable difference.

Results

Core emergency ability of nursing students

After the training, the scores of preparation ability, prevention ability, and rescue ability of nursing students increased (all P<0.05, **Figure 1**).

Humanistic care ability and clinical practice ability

After the training, humanistic care ability, theoretical examination scores, operational skills scores and disease grading ability scores of nursing students all increased (all P<0.05, **Figure 2**).

Active learning ability

After the training, the scores in terms of task analysis, self-motivation belief, self-evaluation, self-monitoring and adjustment, and total scores of nursing students all increased (all P<0.05, **Figure 3**).

Nursing students' critical thinking ability

After the training, the CTDI-CV scale scores of nursing students in all dimensions increased (all P<0.05, **Figure 4**).

Nursing students' awareness of hospital epidemic prevention and control

The correct rate of nursing students' cognition in hospital epidemic prevention and control after the training increased (P<0.05, **Table 3**).

Satisfaction of the patients on the service of nursing students

The total satisfaction of patients on the diagnosis and treatment service of nursing students after training increased (P<0.05, **Table 4**).

Discussion

The training program on emergency response ability for nursing students in the emergency department constructed in this study is reasonable and feasible

In this study, we prepared the training program based on systematic evaluation of evidence-based medicine in strict compliance with international Cochrane regulations and conducted a process of literature retrieval and analysis, so the initial preparation of the training program is rigorous and scientific. Delphi method, also known as expert survey method, is an intuitive prediction technique that integrates the experience and subjective judgment of many experts. It is widely applied in nursing education, community nursing, clinical nursing and nursing management [11, 12]. The experts involved in this study were all from associated fields including medical treatment, nursing management and clinical nursing, and they were equipped with rich theoretical knowledge and clinical experience, so they were representative. The

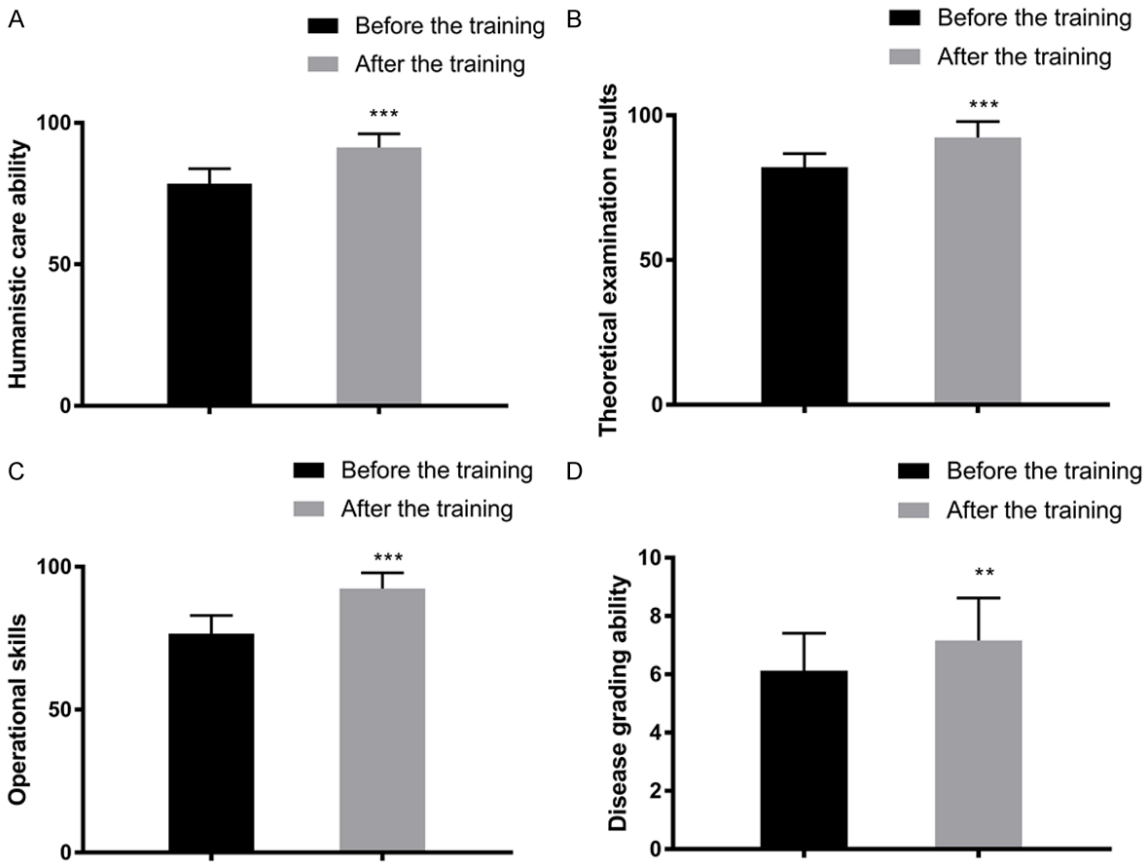

Figure 2. Comparison of humanistic care ability and clinical practice ability of 75 nursing students before and after the training. Notes: (A) The humanistic care ability of students increased after the training. ***P<0.001; (B) The theoretical test scores of students increased after the training, ***P<0.001. (C) The operation skill scores of students increased after the training, ***P<0.001. (D) The ability of disease grading of students increased after the training, **P<0.01.

effective recovery rates of two rounds of questionnaire were 94.44% and 88.89% respectively, suggesting that the enthusiasm of experts was high. Cr of the two rounds was 0.824 and 0.835, respectively, so the expert authority was also high. The coordination coefficient of the two rounds was 0.398 and 0.421, respectively, which were high and indicated reliability of results of the correspondence. The second-round program had obviously been recognized by more experts, so the opinions tended to be unified.

Emergency response ability training can improve emergency response ability and comprehensive nursing ability of nursing students

The World Health Organization has proposed that training on coping ability of nursing students to public health emergencies can avoid or reduce nursing errors, improve the quality of nursing work, and lower the chance of pathogen exposure during work [13]. The American Public Emergency Response Center worked out a roadmap for emergency preparedness and completed 15 training activities including lectures and discussions through motivational, empirical and game-like learning. After the training, the core ability of nurses to respond to emergencies gradually increased [14]. Nevin et al. [15] have reported that the simulated teaching model can broaden nursing students' emergency knowledge, enhance their emergency response ability and promote the formation of critical thinking. Wood et al. [16] have revealed that the teaching mode based on evidence-based medicine can improve the training effect of nursing students in the emergency department. However, at present, there is no unified training program at home and abroad

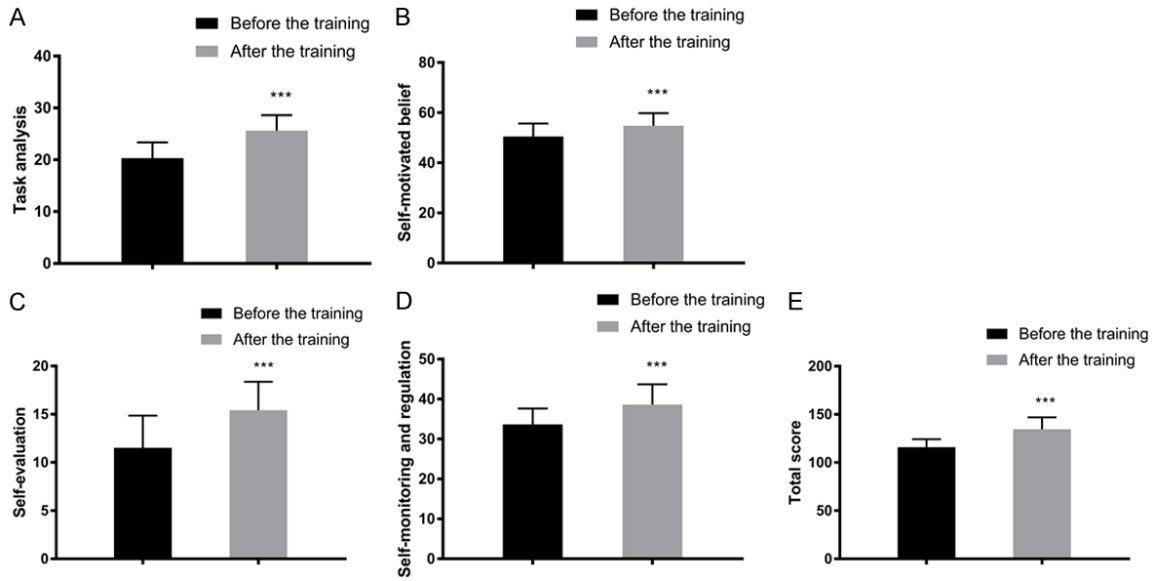

Figure 3. Comparison of active learning ability of 75 nursing students before and after the training. Notes: (A) Task analysis ability of students increased after the training, ***P<0.001. (B) Self-motivation belief of students increased after the training, ***P<0.001. (C) Self-evaluation of students increased after the training, ***P<0.001; (D) The self-monitoring and adjustment ability of students increased after the training, **P<0.01; (E) The total score of students increased after the training, ***P<0.001.

on improving the emergency response ability of nursing students in the emergency department. Foreign studies have revealed that the most familiar link of nursing students in the process of emergency rescue is basic first aid technology, but their knowledge and operation skills in self-protection, communication, caring for radiation-exposed patients, health and epidemic prevention are weak [17, 18]. Therefore, in this study, the training of clinical practice skills should be adopted additionally when constructing the emergency training program, including the monitoring and reporting of public health emergencies, specimen collection from patients with infectious diseases, the ability to cooperate with doctors, mental health maintenance, stress and stress response, humanistic care and service, etc. The results showed that after the training, the scores of nursing students' preparatory ability, prevention ability, rescue ability, humanistic care ability, theoretical test scores, operational skills, disease grading ability, active learning ability and critical thinking scores all increased. It indicated that the training program for emergency response ability of nursing students in the emergency department based on evidence-based practice and Delphi method was effective, which could improve their emergency response ability, active learning ability, humanistic care ability and operational skills. The reasons are as follows: (1) The diversified training programs such as online teaching video viewing, data reading, offline on-site explanation and on-site teaching have been adopted, which not only facilitate nursing students to learn and review relevant contents, but also improve their mastery of basic knowledge and operational skills, and meet the requirements of epidemic prevention and control [19]. (2) The training content of emergency response ability constructed in this study covers basic knowledge of public health emergencies, emergency response ability, critical thinking ability, management ability, etc., and covers the abilities that a nursing student in the emergency department should have from theoretical knowledge and operational skills [20]. (3) Construction of the comprehensive emergency response ability system for nursing students, designing of specific emergency response ability training items, and training for nursing students' emergency response ability by stages all contribute to increases in the emergency response ability and comprehensive nursing ability of nursing students in a spiral trend. After standardized practice and theoretical training, nursing students of the emergency department can give full-course and

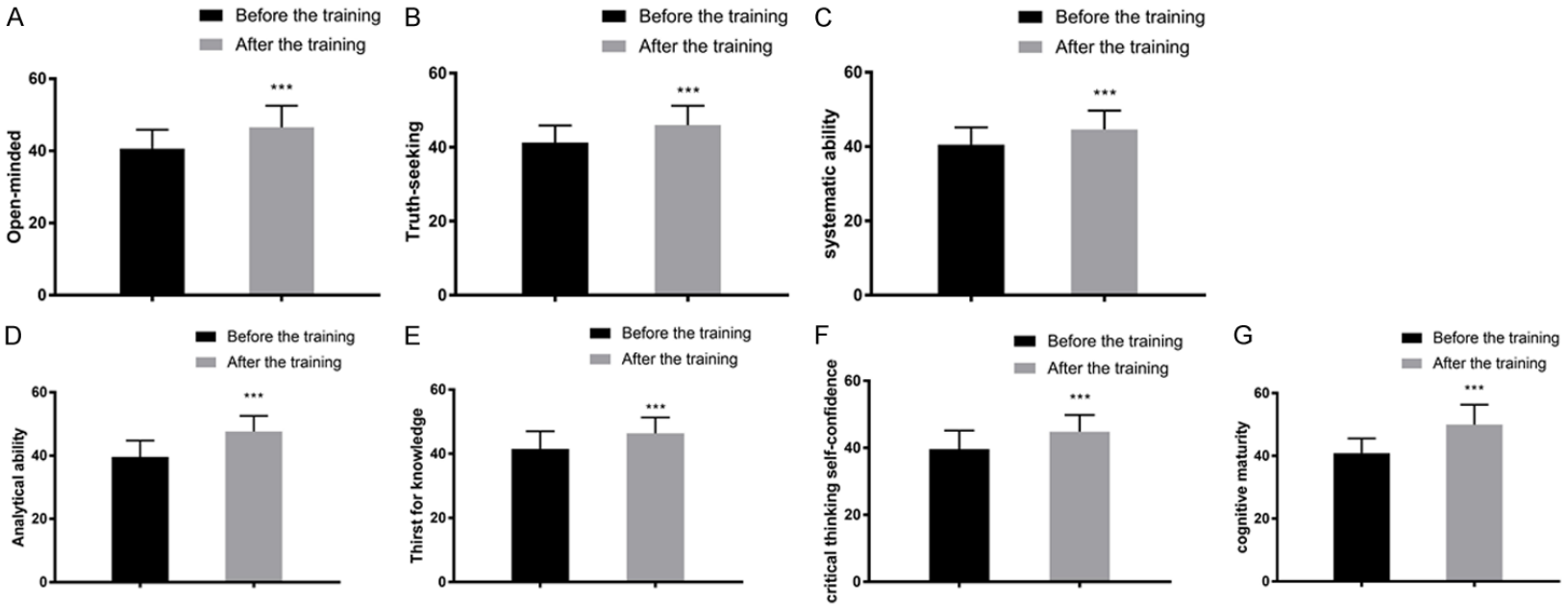

Figure 4. Comparison of critical thinking ability of 75 nursing students before and after the training. Notes: (A) After the training, the open mind of students increased, ***P<0.001; (B) After the training, the truth-seeking ability of students increased, ***P<0.001; (C) After the training, the systematic ability of students increased; ***P<0.001; (D) After the training, the analytical ability of students increased, **P<0.01. (E) The thirst for knowledge of students increased after the training, ***P<0.001; (F) The critical thinking self-confidence of students increased after the training, ***P<0.001. (G) The cognitive maturity of students increased after the training, ***P<0.001.

Table 3. Comparison of the correct cognition rate of 75 nursing students on hospital epidemic prevention and control before and after training n (%)

Time	Do you think it is better to wear as much protective equipment as possible	Do you think it is necessary to perform hand hygiene operation after taking off each layer of protective equipment	do you think it is necessary to spray with disinfectant before taking off protective equipment	Do you think the hospital needs to air disinfect the outdoor environment	Do you think hospitals need to disinfect places where patients stay for a short time
Before training	68 (90.67)	64 (85.33)	65 (86.67)	62 (82.67)	67 (89.33)
After training	74 (98.67)	72 (96.00)	74 (98.67)	73 (97.33)	75 (75.00)
χ^2	4.754	5.042	7.946	8.963	8.451
P	0.029	0.025	0.005	0.003	0.004

Table 4. Patients' satisfaction on the service of nursing students before and after the training, n (%)

Time	Very satisfied	Satisfied	Dissatisfied	Total satisfaction
Before training	21 (28.00)	41 (54.67)	13 (17.33)	62 (82.67)
After the training	39 (52.00)	33 (44.00)	3 (4.00)	72 (96.00)
χ^2				6.996
P				0.008

standardized guidance to patients according to the operation process. Moreover, after interdisciplinary knowledge learning, nursing students can promote interdisciplinary writing and further provide professional nursing services for patients. Thus, patients' satisfaction with nursing students' services has increased.

Limitations and prospects of this study

This study still has some limitations. For instance, it is difficult to popularize some items strongly recommended in the guidelines because of the restrictions of domestic nursing manpower, national conditions and other factors. The training of nursing students in the emergency department is a difficult task. During the development of training program, it was difficult to refer to all types of literature, although the reference search was as comprehensive as possible. Additionally, the included literature such as guidelines, reviews and expert consensus has a specific update cycle, so some of the latest original research results may be not included. In the follow-up study, it is necessary to focus on the feelings and problems in the implementation of the program and conduct in-depth interviews with qualitative research methods for obtaining training feedback and experience to further optimize the training program.

In conclusion, the training program based on evidence-based practice and Delphi method for nursing students in the emergency department under COVID-19 epidemic situation is reliable and practical to improve their emergency response ability, which can fully stimulate their active learning ability, enhance their humanistic care ability and operation skills, and contribute to high patient satisfaction.

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Disclosure of conflict of interest

None.

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References

[1] Yüce M, Filiztekin E and Özkaya KG. COVID-19 diagnosis -a review of current methods. Biosens Bioelectron 2021; 15: 112752.

[2] Ochani R, Asad A, Yasmin F, Shaikh S, Khalid H, Batra S, Sohail MR, Mahmood SF, Ochani R, Hussham Arshad M, Kumar A and Surani S. CCOVID-19 pandemic: from origins to outcomes. A comprehensive review of viral pathogenesis, clinical manifestations, diagnostic evaluation, and management. Infez Med 2021; 29: 20-36.

[3] Carpenter CR, Mudd PA, West CP, Wilber E and Wilber ST. Diagnosing COVID-19 in the emergency department: a scoping review of clinical examinations, laboratory tests, imaging accuracy, and biases. Acad Emerg Med 2020; 27: 653-670.
[4] Ranzani OT, Hitchings MDT, Dorion M, D'Agostini TL, de Paula RC, de Paula OFP, Villela EFM, Torres MSS, de Oliveira SB, Schulz W, Almiron M, Said R, de Oliveira RD, Vieira da Silva P, de Araújo WN, Gorinchteyn JC, Andrews JR, Cummings DAT, Ko AI and Croda J. Effectiveness of the CoronaVac vaccine in older adults during a gamma variant associated epidemic of COVID-19 in Brazil: test negative case-control study. BMJ 2021; 374: 2015.
[5] Galanis P, Vraka I, Fragkou D, Bilali A and Kaitelidou D. Nurses' burnout and associated risk factors during the COVID-19 pandemic: a systematic review and meta-analysis. J Adv Nurs 2021; 77: 3286-3302.
[6] Arnetz JE, Goetz CM, Arnetz BB and Arble E. Nurse reports of stressful situations during the COVID-19 pandemic: qualitative analysis of survey responses. Int J Environ Res Public Health 2020; 17: 8126.
[7] Sastre-Fullana P, Morales-Asencio JM, Sesé-Abad A, Bennasar-Veny M, Fernández-Domínguez JC and Pedro-Gómez JD. Advanced practice nursing competency assessment instrument (APNCAI): clinimetric validation. BMJ Open 2017; 7: e013659.
[8] Bateman RM, Sharpe MD, Jagger JE, Ellis CG, Solé-Violán J, López-Rodríguez M, Herrera-Ramos E, Ruíz-Hernández J, Borderías L, Horcajada J, González-Quevedo N, Rajas O, Briones M, Rodríguez de Castro F, Rodríguez Gallego C, Esen F, Orhun G and Ergin Ozcan P. 36th International Symposium on Intensive Care and Emergency Medicine: Brussels, Belgium. 15-18 March 2016. Crit Care 2016; 20 Suppl 2: 94.
[9] Zeng YM. Construction and practice of comprehensive emergency response ability training system for nurses. Chinese Journal of Nursing 2019; 54: 1136-1141.
[10] Wang X, Sun X, Huang T, He R, Hao W and Zhang L. Development and validation of the critical thinking disposition inventory for Chinese medical college students (CTDI-M). BMC Med Educ 2019; 19: 200.
[11] Romero-Collado A. Essential elements to elaborate a study with the (e)Delphi method. Enferm Intensiva (Engl Ed) 2021; 32: 100-104.
[12] Borel MCG, Lopes ROP, Thofehrn MB, Nóbrega MMLD, Arreguy-Sena C and Brandão MAG. Guideline for incorporating the Delphi method in the evaluation of nursing theories. Rev Lat Am Enfermagem 2021; 29: e3387.
[13] World Health Organization. WHO Ebola virus disease[EB/OL].(2015-04) [2015-04-29]. http://www.who.int/mediacentre/factsheets/fs103/en/.
[14] Parker CL, Barnett DJ, Fews AL, Blodgett D and Links JM. The road to preparedness: a competency-based approach to all-hazards emergency readiness training for the public health workforce. Public Health Rep 2005; 120: 504-514.
[15] Nevin M, Neill F and Mulkerrins J. Preparing the nursing student forinternship in a pre-registration nursing program: developing a problem based approach with the use of high fidelity simulation equipment. Nurse Educ Pract 2014; 14: 154-159.
[16] Wood DB, Jordan J, Cooney R, Goldflam K, Bright L and Gottlieb M. Conference didactic planning and structure: an evidence-based guide to best practices from the council of emergency medicine residency directors. West J Emerg Med 2020; 21: 999-1007.
[17] Kayama M, Akiyama T, Ohashi A, Horikoshi N, Kido Y, Murakata T and Kawakami N. Experiences of municipal public health nurses following Japan's earthquake, tsunami, and nuclear disaster. Public Health Nurs 2014; 31: 517-525.
[18] Veenema TG, Rains AB, Casey-Lockyer M, Springe J and Kowal M. Quality of healthcare services provided in disaster shelters: an integrative literature review. Int Emerg Nurs 2015; 23: 225-231.
[19] Tognetto A, Michelazzo MB, Ricciardi W, Federici A and Boccia S. Core competencies in genetics for healthcare professionals: results from a literature review and a Delphi method. BMC Med Educ 2019; 19: 19.
[20] Marcomini I, Agus C, Milani L, Sfogliarini R, Bona A and Castagna M. COVID-19 and post-traumatic stress disorder among nurses: a descriptive cross-sectional study in a COVID hospital. Med Lav 2021; 112: 241-249.