RESEARCH

The present situation of the nursing practice environment and its influence on nursing quality in a post-epidemic era: a cross-sectional study

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Abstract

Background Nursing Practice Environment is an important index to improve nursing quality and patient outcome. To explore the nursing practice environment in the COVID-19 ward during the period of COVID-19 and its impact on nursing quality to provide reference for setting up supporting nursing team in epidemic area in the future.

Methods A cross-sectional survey was conducted among 251 nurses working in COVID-19 ward in Shanghai, Hainan and Hunan in December 2022 through stratified proportional sampling. Structured questionnaires, including general information questionnaire, professional practice environment scale and nursing quality questionnaire, were used to investigate the patients. Pearson correlation was used to analyze the correlation between nursing practice environment and nursing quality, and multiple linear regression analysis was used to analyze the influencing factors of nursing quality in the COVID-19 ward.

Results The professional practice environment scale score was (3.34 ± 0.40), the nursing quality questionnaire score was (9.47 ± 0.81), both at a high level. Single factor analysis showed that nursing quality was related to educational background, physical condition, professional title, grade of the original hospital and composition of nursing staff in supported departments. Nursing quality were positively correlated with each nursing practice environment dimensions (in addition to teamwork). The results of regression analysis showed that the nursing practice environment in the COVID-19 ward had a positive impact on nursing quality.

Conclusions The nursing practice environment and nursing quality of nurses in the COVID-19ward is generally very high. The education, working hospital level and nursing practice environment of nurses are the important factors influencing nursing quality. The relationship between nursing practice environment (include leadership and autonomy in clinical practice, staff relationships with physicians, control over practice, communication about patients, handling disagreement and conflict, internal work motivation and cultural sensitivity) and nursing quality is positive. It is suggested that the hospital should pay special attention to and improve nursing practice environment in order to

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improve nursing quality when setting up temporary ward in the future epidemic period of infectious diseases, ensure patient safety.

Impact on clinical practice   Research shows that an active nursing practice environment can improve the quality of care, and nursing managers create and maintain an active practice environment to improve the quality of care and ensure patient safety.

Keywords   The post epidemic period, Nursing practice environment, Nursing quality, COVID-19 ward

Introduction

The professional practice environment is defined as the organizational characteristics of a nursing practice environment that promotes or restricts professional nursing practice [1]. A positive professional practice environment can make nurses put into professional practice, enhance communication and cooperation between doctors and nurses, and promote healthy patient outcomes [2]. At the same time, a good environment of professional nursing practice also helps to reduce burnout, improve nurses' job satisfaction, and improve the quality of patient care [3, 4]. On the contrary, a poor practice environment for nurses will make nurses dissatisfied with their profession, fatigue, burnout and intention to leave in nurses working, resulting in reduced anticipation of and sensitivity to potential dangers and increased more missed nursing care events, affecting patient safety [5–8]. The study found that the working environment of nurses was directly related to nurse satisfaction and patient safety [6, 9]. Hence, creating a safe and loving practice environment for nurses can help nurses become more motivated and reduce existing concerns about the quality of care.

The emergence of the human coronavirus SARS-CoV-2 strain plunged the world into a new infectious disease pandemic in 2019. As the first country to detect COVID-19, China has effectively controlled the epidemic in 2020 and implemented normalize management of the epidemic. It has entered the post-epidemic period, which is characterized by frequent outbreaks of small intensity [10, 11]. In the post-epidemic era, hospitals should not only continue to undertake routine diagnosis and treatment, but also have to be in a state of readiness to combat outbreak of COVID-19. By the end of the 2021, our nurses had reached 5.018 million, according to the National Health Commission of the People's Republic of China [12]. When the epidemic breaks out, the Chinese government will organize nurses from all over the country to support local hospitals, and patients will be arranged in specialized COVID-19 ward. The deterioration of the working environment as a result of the COVID-19 (e.g. increased risk of infection, increased psychological burden, physical discomfort caused by prolonged wearing of protective gear, etc.) and the critical condition of patients lead to the excessive work pressure of nurses, making them more likely to develop negative emotions such as fatigue, insomnia and psychological stress, affect the quality of care and patient safety [13, 14]. Good professional nursing practice environment can help reduce burnout, improve nurse job satisfaction, improve patient care quality [3, 4]. Therefore, it is necessary to provide high-quality care supported by experience and research, strengthening of basic nursing measures, and overall enhancement of nursing services in the COVID-19 Ward, reduce the length of hospital stay and reduce the morbidity and mortality of COVID-19 pneumonia.

However, as we known researchers did not study how the nursing practice environment in the COVID-19 ward of designated hospitals in China had concrete impact on the quality of care. Chen et al. [15] noting the changes in the nursing environment brought about by COVID-19 and nurses' views, but this study is not a quantitative survey on the effect of nursing practice environment on nursing quality. The purpose of this study is to describe the nursing practice environment of nurses in the novel coronavirus ward, improve the current situation of the nursing practice environment in the novel coronavirus ward, so as to promote the improvement of nursing quality, better play the important role of nurses in the COVID-19 ward, and provide reference for the occurrence of similar major infectious diseases in the future.

Methods

Study design

This study followed the STROBE guidelines for cross-sectional study. This cross-sectional survey in which nurses were invited to fill out a COVID-19 ward care quality questionnaire through a questionnaire website. (https://www.wjx.cn/)

Participants and sample size

This study selected hospitals in Hainan Province, Hunan Province and Shanghai City, three regions with severe epidemics in the country (one hospital in each region), the total number of anti-epidemic nurse in the three hospitals was 534. After obtaining the informed consent of the hospital and participants, a proportionate stratified sampling technique was conducted according to the strata of different departments on nurses on the COVID-19 ward from December 21 to 27, 2022. A complete list of qualified nurses (for sampling purposes) was

first provided by the nursing department to determine the proportion of nurses to be drawn from each hospital. Subsequently, the number of nurses drawn from each department was then determined by the ratio of the number of nurses in each hospital department to the total number of nurses in the hospital. Inclusion criteria include; (1) Nurses holding nursing certificate; (2) Now or ever worked in the COVID-19 ward, with working hours≥4 h per day for at least two weeks; (3) Participants gave informed consent and were able to cooperate with the study. The nurses who quit after filling in the form of informed consent were excluded.

The Cochran formula for estimating sample size was used, where t=1.96, *p*=0.5,d=0.05. The formula is as follows;

$$n = \frac{Nt^2 \rho q}{Nd^2 + t^2 \rho q}$$

The sample size was calculated by the Cochran formula to be 223, considering a 10% non-response rate, and finally the required sample size was calculated to be at least 245 cases.

Measurement tool
This research questionnaire consists of three parts: general information questionnaire, Professional Practice Environment scale(Professional Practice Environment scale, PPE)and the nursing quality questionnaire.

General information questionnaire
The questionnaire was constructed by consulting domestic and foreign literatures and clinical experience, collected the gender, age, marital status, physical status, education, work experience (years), professional titles and positions, composition of nursing staff in supported departments, whether the nurse has intensive-care unit working experience, grade of the original hospital.

Professional Practice Environment scale(PPE)
Professional Practice Environment scale is used to measure the current situation of nursing practice environment, Constructed in 2004 by Erickson, Duffy, Mary et al [1]. A total of 38 items were used to measure occupational practice environment characteristics. The scale consists of eight dimensions, including leadership and autonomy in clinical practice(5 items), staff relationships with physicians (2 items), control over practice (7 items), communication about patients (2 items), teamwork (4 items), handling disagreement and conflict (8 items), internal work motivation (7 items) and cultural sensitivity (3 items). Each item is divided into 4 options, from 1 point "strongly disagree" to 4 "strongly agree". The average score range of each dimension and its items is 1 to 4.

The higher the score, the better the professional practice environment. PPE scale has been used in various studies and proved to have good reliability and validity. This research adopts the Wang Xia [16]. The Cronbach'α coefficient of the revised scale was 0.89 after cultural adjustment. Previous Study [17] have utilized a critical value of 3.0 to describe the work environment for nurses in China, which accurately assessed working environment of nurses. Therefore, this study selected a 3.0 dimensions score to describe the status of nursing perceptions of the professional practice environment.

The nursing quality questionnaire
The nursing quality questionnaire was developed based on the nursing sensitivity index system of respiratory medicine department, which was established by Cui Jinrui et al [18]. The total Cronbach α coefficient was 0.884. This is a self-assessment questionnaire, categorized into seven distinct dimensions(55 items): ward management(8 items), nursing risk assessment and implementation(5 items), nursing practice(12 items), nursing operation technique(13 items), important examination and test indicators(7 items), health education(5 items) and doctor-nurse-patient cooperation(5 items). Each dimension score is the average of the sum of the scores of all entries within that dimension, each dimension ranged from 0 to 10. The total scale score is the average of 55 items. The higher the score, the better of nursing quality.

Data collection
The project leader provided uniform and standardized training to nursing administrators in three hospitals before the start of this study, instructing them to clarify the exclusion criteria and important considerations before distributing the questionnaires. The survey questionnaires were distributed by the nursing administrators of each hospital to the nurses online. Participants were invited to complete the COVID-19 Quality of Ward Care Questionnaire online via a questionnaire website. (https://www.wjx.cn/). Once the data collection was completed, the researcher exported and organized the data collected from the online questionnaire into Excel tables. After deleting the invalid data, the organized data from these Excel tables were imported into SPSS for analysis.

Data analysis
SPSS version 26.0 software was used to analyze the data. The measurement data were expressed as mean and standard deviation, and the counting data were expressed as frequency and percentage. T-test, analysis of variance, Pearson correlation analysis, and multivariate Regression analysis nursing quality were used to analyze the

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influencing factors, and the differences were statistically significant with $P<0.05$.

Quality control and ethical considerations

This study was reviewed and approved by the Ethics Committee of Xiangya Hospital, Central South University(No.202211250), and it strictly adheres to the ethical guidelines as outlined in the Declaration of Helsinki. Firstly, We invited the nursing managers ($n=10$) of the COVID-19 ward to work together to develop the quality of care questionnaire, after three rounds of meetings to discuss the questionnaire to determine the entries, the questionnaire was filled out by 15 nurses on line prior to the formal survey, and after filling out the questionnaire, a one-on-one interview was conducted, and 15 nurses agreed that the questionnaire was clearly expressed, free of ambiguity, and easy to understand, and the questionnaire was finally finalized to ensure the usability of the questionnaire. The questionnaires were only to be filled out after the participants had fully understood the study and provided their consent, either orally or in writing. After obtaining participants consent to distribute the online questionnaire, an informed consent form was set up on the first page of the questionnaire, and if the participant chose "No", the survey was automatically closed. Participants was clearly communicated that they had the right to withdraw from the study at any time, without facing any repercussions. All the collected information is encrypted on questionnaire website, The researcher logged into after obtaining an account and password through the authorization of the project leader to view the questionnaire collection.

Results

Participant characteristics

A total of 252 questionnaires were collected. After excluding those with missing data, a total of 251 questionnaires were included in the calculation, with an effective recovery rate of 99.6%. The average age of the participants was (32.97 ± 6.61). There were 222 female participants. 77.7% of the nurses had more than 6 years working experience. In terms of education, 72.1% of the nurses had a bachelor's degree, and 80.5% of the COVID-19 ward were composed of supported nurses from several hospitals. A univariate analysis showed that, there were significant differences in nursing quality among nurses with different educational background, physical condition, professional title, grade of the original hospital and composition of nursing staff in supported departments. ($p<0.05$) (Table 1).

Components of nursing quality questionnaire

The average score of nursing quality questionnaire of nurses in the COVID-19 ward was (9.47 ± 0.81), and the scores of all dimensions in descending order were as follows: nursing operation technique (9.65 ± 0.77), ward management (9.58 ± 0.79), nursing practice (9.50 ± 0.91), important examination and test indicators (9.47 ± 0.98), nursing risk assessment and implementation (9.46 ± 0.99), health education (9.39 ± 1.09), doctor-nurse-patient cooperation (9.26 ± 1.12).

Components of professional practice environment scale

Table 2 shows the mean and standard deviation of the total PPE scale scores and dimensions for all participants. As shown in Table 2, the average score of PPE scale for nurses in the COVID-19 ward was (3.34 ± 0.40), nurses generally believed that the working environment was good.

Correlation analysis between the nursing quality dimensions of nurses in COVID-19 ward and nursing practice environment

Table 3 showed the results of Pearson correlation analysis, the total mean score of professional practice environment was positively correlated with the total mean score of nursing quality ($r=0.46$, $p<0.01$). The seven dimensions of the professional practice environment(leadership and autonomy in clinical practice、staff relationships with physicians、control over practice、communication about patients、handling disagreement and conflict、internal work motivation and cultural sensitivity)was a positive correlation between the score and nursing quality ($p<0.01$).Moreover, the results showed teamwork ($r=0.12$, $p=0.06$) has no significant correlation.

Results of multiple linear regression of nursing quality in COVID-19 wards

Multiple linear regression was used to explore the influence of different population characteristics and nursing practice environment on nursing quality. The assignment table is shown in Table 4. As shown in Table 5, multiple linear regression showed that grade of the original hospital ($\beta=0.128$, $p=0.021$), education ($\beta=-0.179$, $p=0.001$) and professional practice environment($\beta=0.458$, $p<0.001$) were influencing factors of nursing quality, explained 25.8% of the variance in nursing quality scores.

Discussion

The purpose of this study was to explore the present situation of nursing practice environment and its influence on nursing quality. The results of the study showed that the nursing practice environment in the COVID-19 ward was good, and the nursing practice environment had an impact on the nursing quality, specifically as follows:

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Table 1 Comparison of nursing quality scores of nurses in COVID-19 wards with different characteristics (*n* = 251)

Variables	N(%)	Nursing quality		
		mean ± SD	t/F	P
Gender			-0.28	0.78
Male	29(11.6)	9.43 ± 0.84		
Female	222(88.4)	9.48 ± 0.81		
Age(years)			0.76	0.52
≤ 25	29(11.6)	9.69 ± 0.51		
26–35	152(60.6)	9.45 ± 0.89		
36–45	56(22.3)	9.44 ± 0.73		
≥ 46	14(5.6)	9.42 ± 0.63		
Education			10.14	<0.01*
Associate degree or below	59(23.5)	9.54 ± 0.74		
Bachelor degree	181(72.1)	9.51 ± 0.74		
Master degree or above	11(4.4)	8.44 ± 1.42		
Physical condition			2.89	0.04*
Health	164(65.3)	9.56 ± 0.75		
Good	74(29.5)	9.29 ± 0.93		
General	12(4.8)	9.51 ± 0.49		
Poor	1(0.4)	8.17 ± 0.00		
Work experience (years)			0.57	0.64
≤ 5	56(22.3)	9.58 ± 0.69		
6–10	78(31.1)	9.47 ± 0.85		
11–15	73(29.1)	9.40 ± 0.89		
≥ 16	44(17.5)	9.47 ± 0.73		
Marital status			0.64	0.53
Married	179(71.3)	9.45 ± 0.80		
Single	72(28.7)	9.52 ± 0.84		
Professional title			3.85	<0.01*
Nurse	35(13.9)	9.72 ± 0.48		
Senior nurse	110(43.8)	9.59 ± 0.78		
Supervisor nurse	92(36.7)	9.31 ± 0.90		
Co-chief nurse	12(4.8)	8.93 ± 0.66		
Chief nurse	2(0.8)	9.43 ± 0.50		
Position			0.54	0.71
No duty	213(84.9)	9.50 ± 0.83		
Head nurse	26(10.4)	9.25 ± 0.66		
Department head nurse	8(3.2)	9.52 ± 0.62		
Director (Deputy) of nursing department	3(1.2)	9.48 ± 0.62		
Dean of nursing	1(0.4)	9.64 ± 0.00		
Grade of the original hospital			-3.98	<0.01*
Level 3	196(78.1)	9.38 ± 0.83		
Level 2 or 1	55(21.9)	9.79 ± 0.62		
Composition of nursing staff in supported departments			-2.28	0.03*
From the same hospital	49(19.5)	9.18 ± 1.07		
From many hospitals	202(80.5)	9.54 ± 0.72		
Worked in ICU			-1.49	0.14
Yes	133(53.0)	9.40 ± 0.89		
No	118(47.0)	9.60 ± 0.70		

Nursing quality: nursing quality questionnaire. * *p* < 0.0

The status of nursing practice environment in COVID-19 ward

The results of this study showed that the average PPE score was (3.34 ± 0.40). Among them, the dimension of staff relationships with physicians had the highest score (3.53 ± 0.53), it shows that the medical cooperation in the COVID-19 ward is close and the harmonious relationship has been established. However, the teamwork dimension

Table 2 Professional Practice Environment scale score(*n* = 251)

Dimension	Total score (Mean ± SD)	Mean	SD
leadership and autonomy in clinical practice	17.32 ± 2.35	3.46	0.46
staff relationships with physicians	7.04 ± 1.03	3.53	0.53
control over practice	24.19 ± 3.48	3.46	0.50
communication about patients	6.92 ± 1.08	3.46	0.50
teamwork	11.33 ± 3.01	3.01	0.68
handling disagreement and conflict	25.04 ± 3.41	3.22	0.37
internal work motivation	24.51 ± 3.44	3.50	0.49
cultural sensitivity	10.45 ± 1.50	3.48	0.50
Overall	126.80 ± 15.07	3.34	0.40

Table 3 Correlation analysis between professional practice environment and nursing quality of nurses in COVID-19 wards (*r*)

	Nursing quality score
leadership and autonomy in clinical practice	0.42**
staff relationships with physicians	0.42**
control over practice	0.45**
communication about patients	0.42**
teamwork	0.12
handling disagreement and conflict	0.34**
internal work motivation	0.42**
cultural sensitivity	0.38**
PPE scale score	0.46**

**P < 0.05

has the lowest average score(3.01 ± 0.68),and "This ward can not get the cooperation it needs from other wards" and "The lack of close cooperation with other departments of the hospital limits the effective development of work in this ward" had low scores, indicated the bad cooperation between the nurses in the ward. Good doctor-nurse relations but low scores for teamwork are consistent with a work environment for retired nurses in China [19]. In addition handling disagreement and conflict dimension score is also low, At the same time, "Everyone ignores or avoids disagreement between members" is the lowest, This indicates that the cooperation between nurses and the communication between nurses and other wards needs to be strengthened. On the one hand, faced with the risk of cross-infection during a pandemic, the COVID-19 ward is under closed management, there is a lack of effective communication between departments. Previous studies also have pointed out that physical barriers (i.e., personal protective equipment) and spatial barriers (i.e., social distance) implemented during the pandemic disrupted workflow and communication and affected teamwork [20, 21]. On the other hand, a study pointed out that health care workers in COVID-19 critical care were more likely to frequently work with each other than those in non–COVID-19 critical care [22]. 85.2% of the nurses (*n* = 92/108) in the ICU ward came from different hospitals in our study. Due to the different age, geography, and cultural level of nurses in each area, as well as the difficulty of establishing effective teamwork in a short period of time in a temporarily formed team, which leads to unsuccessful teamwork. Effective teamwork is facilitated by timely, frequent,

Table 4 Assignment of variables in multiple linear regression

Variable	Name	Assignment
Y	nursing quality	Original values
X1	Education	Associate degree or below = 1;Bachelor degree = 2;Master degree or above = 3
X2	Grade of the original hospital	Level 3 = 1; Level 2 or 1 = 2
X3	Physical condition	Health = 1; Good = 2; General = 3; Poor = 4
X4	Professional title	Nurse = 1; Senior nurse = 2; Supervisor nurse = 3; Co-chief nurse = 4; Chief nurse = 5
X5	The composition of nursing staff in the department	From the same hospital = 1; From many hospitals = 2
X6	Professional Practice Environment scale	Original values

Table 5 Multiple linear regression analysis of nursing quality in COVID-19 wards(*n* = 251)

independent variable	b	SE	β	t	*p*
(Constant)	6.834	0.397		17.220	<0.001
Grade of the original hospital	0.250	0.108	0.128	2.321	0.021
Education	-0.293	0.090	-0.179	-3.261	0.001
Professional practice environment	0.933	0.113	0.458	8.290	<0.001
Model fit	$R^2 = 0.267$, Adjusted $R^2 = 0.258$, $F = 29.999$, $p < 0.001$				

accurate, problem-solving communication based on shared knowledge, common goals, and mutual respect [23]. Therefore, nursing managers should pay attention to the relationship between doctors and nurses, encourage the exchange of important clinical information between nurses and doctors, and strengthen the cohesion and teamwork of the whole team.

At the same time, we found that the internal work motivation dimension scores were at the top. Moreover, "I feel a high degree of personal responsibility for the work I do." and "My discipline controls its own practice" also rank at the top, it indicated that the nurses thought that the working conditions of the COVID-19ward were better and the nurses had a high sense of responsibility, which made the nurses mobilize their own enthusiasm. Research shows that individual factors (e.g., emotional intelligence, self-reflectiveness, confidence, communication style), attitudinal factors mediated by the team (e.g., accountability, commitment, values or enthusiasm), and lastly socio-economic factors (e.g., education, culture) were all found to influence individual's attitudes and behaveours vis-à-vis colleagues, impacting the work environment in which teamwork occurred [24]. Organizing teamwork training and clarifying team roles can improve team relationships [25], It is suggested that the manager should carry out team cooperation according to the situation of the ward, and make clear the nursing responsibility of each nurse, attach importance to the opinion of each nurse, and jointly create a harmonious and mutual help working environment.

The status of nursing quality in COVID-19 ward
According to the results of this study, the nursing quality of Chinese nurses during the COVID-19 period was relatively high, and the average score of nurses in the COVID-19 ward was (9.47±0.81).Based on previous research [26], we believe that is related to higher standards, stringent ward environment in the COVID-19 ward and to the increased professional competence of nurses.

Nurse characteristics have relationship between high nursing quality and patient results [27]. A total of 88.4% female nurses participated in the study, 60.6% were between 26 and 35 years old, and 31.1% had worked for 6 to 10 years. The results showed that the front-line nurses were all experienced nurses, which enabled them to provide quality care. In addition, a shocking the nursing quality scores for associate degrees or below are higher than those for bachelor's, which may be because of the It may have to do with the fact that highly educated nurses demand more from their own development. The more educated nurses are, the more demand for your own development, thus scoring lower on the self-assessed quality of care scores.

We showed that the highest score dimension was nursing operation technique (9.65±0.77), which indicated that all nurses performed the operation according to the ward standard. And the dimension with the worst score is "doctor-nurse-patient cooperation" and "health education". This may be due to the busy clinical work of nurses, long working hours, heavy tasks of epidemic prevention leading to insufficient attention and assessment to patients. Moreover, nurses may reduce direct contact with patients and doctors at work due to fear of infection, thus resulting in poor health education for patients and communication with doctors Meanwhile, patients felt anxious and reluctance to communicate with medical and nursing staff due to the disease. Therefore, hospitals should strengthen the knowledge related to 2019 coronavirus disease pneumonia training so that nurses can receive timely, accurate, precise and comprehensive education on health knowledge and disease assessment, and relieve patients' tension and anxiety through humanistic care and health education so that they can actively cooperate with treatment and care.

Nursing quality on COVID-19 wards is influenced by multiple factors
The regression analysis showed that the nursing quality was influenced by the degree of education and the rank of Nursing Hospital, which is consistent with the study by Fitzpatrick et al [28]. This may be related to the fact that highly educated nurses have a more systematic knowledge of nursing and are more likely to work in higher-level hospitals, and that examinations are more frequent in level 3 hospitals than in level 2 and lower hospitals. In China, hospitals are classified into three levels from small to large based on their scale (staffing, hardware facilities, research capabilities, etc.) [29, 30]. Among them, the third-level hospitals are representative of the large comprehensive hospitals in our country, often possessing more advanced large medical equipment and medical technology, and are responsible for important tasks such as the treatment of critical illnesses and specialized diagnosis and treatment [29]. Nursing quality is an important indicator for evaluating the level of hospitals, so nurses in higher level hospitals tertiary hospitals tend to face high level of work requirements, which poses a higher challenge to the nurses' own competence. Previous studies [31, 32] have shown that nurses in tertiary hospitals have stronger professional competencies such as information competency and emergency management competency than nurses in secondary and lower hospitals. This shows that it is necessary for nursing managers to focus on the cultivation of nursing professional skills, particularly for nurses at the secondary level and below hospital, which is ensures the quality and efficiency of nursing services. The results of this study show that education was a negative

variable of nursing quality. This may be due to the fact that healthcare workers with higher academic qualifications may have a heavier workload, not only needing to complete clinical frontline medical and nursing care, but also different roles such as teaching, scientific research, management, and so on, which gives them a higher sense of responsibility for their patients, resulting in a greater work pressure [33], and thus impacting on the quality of their care. In addition, the number of nurses with Master degree or above in this study was only 11 (4.4%), so it is necessary to continue to expand the sample in the follow-up study for further in-depth analysis.

Numerous studies have demonstrated that a better professional nursing practice environment can lead to higher nursing quality [34–36]. The results of correlation analysis showed that the nursing practice environment all other dimensions except teamwork, were positive related to nursing quality. We hypothesized that it may be due to the particularity of the setting of the COVID-19 ward. The better the nursing practice environment was, the higher level of nursing quality in the COVID-19 ward was. Zelauskas et al [37]showed that environment of professional nursing practice means that the nurse in nursing service, through authorized managers have more autonomy, and responsibility to work environment. A study of 69 hospitals in 217 Chinese provinces found that the longer nurses worked in COVID-19 ward, the worse the quality of care [38]. At the same time, Cheng et al [15] showed that COVID-19 had brought positive changes to the nursing practice environment. For example, nurses have a greater say in the organization and work more closely with doctors. However, there are also some problems, such as the difficulty of ward management and increased occupational risks, and the safety and comfort of the ward environment need to be improved. Therefore, it is suggested that managers should arrange shift patterns scientifically, optimize and rationally allocate personnel, provide adequate rest time, and reduce the workload of nurses, ward managers need to develop simple and standard management patterns, establish good ward facilities and rest environment.

Limitation
This study has some limitations. First of all, this study aimed at the cross-sectional investigation in the post-epidemic period, is a specific environment. It is not applicable after the COVID-19 pandemic, provides reference for similar outbreaks of infectious diseases in the future. Second, the data in this study were the result of nurses' self-report, so there may be bias. However, this study can provide a reference for nursing managers to improve the quality of nursing care from the perspective of improving the working environment during the outbreak of infectious diseases.

Impact on clinical practice
Our study participants were nurses in the COVID-19 ward of designated hospitals, our evidence and recommendations will contribute to improved care practices.

The results showed that the working environment of the nurses in the COVID-19.

ward was good, and the nursing practice environment was much improved compared with the previous studies, especially the leadership ability, autonomy and cultural sensitivity in the clinical practice. However, team cooperation is not good enough. COVID-19 wards require multidisciplinary teamwork, so we should focus on training nurses' team cooperation ability to promote the friendly development of the ward. In addition, nurses' clinical practice ability affects nursing outcomes. Among the seven dimensions of nursing quality, doctor-nurse-patient cooperation scored the lowest, which also indicates that doctor-nurse-patient communication needs to be improved. The quality of nursing is influenced by grade of original hospital, nursing education and nursing practice environment. Therefore, sending excellent nurses and training local nurses, promoting good cooperation between medical and nursing staff, and improving the working environment of nurses can effectively improve the quality of care.

Conclusion
Even though we are a temporary team, the nursing practice environment and nursing quality of nurses in the COVID-19 ward are still at a high level in the post-epidemic period, the level of nursing quality was different with different characteristics (grade of the original hospital, education). In addition, the nurse practice environment has proven to have a positive impact on the quality of care. PPE scale score (include leadership and autonomy in clinical practice、staff relationships with physicians、control over practice、communication about patients、handling disagreement and conflict、internal work motivation and cultural sensitivity)was correlated with nursing quality score. In order to improve nursing quality, it is suggested that nursing managers should adopt supportive management, arrange human resources reasonably, authorize appropriately, cooperate with each other to create a good working environment, to enable nurses to have a better working state to deal with ward nursing matters, thus improving the quality of clinical care.

Author contributions
Z.Y.*: Conceptualization and design. LXT: Writing-Original draft preparation. GYB&ZY: Investigation, Methodology. All authors read and approved the final manuscript.

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Declarations

Ethics approval and consent to participate
This study was reviewed and approved by the Ethics Committee of Xiangya Hospital, Central South University (No.202211250). All participants have given informed consent. And the methods in this study were conducted in accordance with relevant guidelines and regulations.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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