RESEARCH



Experiences, challenges, and training reflections of nurses in isolation wards during different pandemic prevention policy periods: a qualitative study

Dandan Zhang^{1,2}, Yitong Jia², Yongjun Chen¹, Qingqing Liao¹, Meimei Wang^{1*†} and Yin-Ping Zhang^{2*†}

Abstract

Background During the pandemic, China's control policies shifted from nationwide restrictions to precise control and monitoring, which ended with complete relaxation, presenting unique challenges for nurses. Existing qualitative studies mostly focused on the experiences of frontline nurses in the early stages of the pandemic, but they overlooked the dynamic nature of the role changes and adaptation processes as the pandemic evolved. In-depth research into nurses' experiences across different control phases is crucial for guiding future training to improve preparedness and policy enhancements.

Objective To explore the experiences and challenges faced by frontline nurses in China during different phases of pandemic control policies. It also evaluates their training, reflects on the inadequacies of the training, and discusses how these experiences can inform future training programs while offering recommendations to enhance future emergency preparedness.

Methods This study employed a qualitative descriptive design to explore the experiences and insights of nurses during the pandemic, as well as their attitudes toward training. Twenty-four frontline nurses from various hospitals in China were recruited using snowball sampling for in-depth interviews, which spanned two months. Data analysis was conducted using Giorgi's phenomenological approach, involving coding and theme extraction.

Results From a content analysis perspective, five main themes were extracted from different stages of control policies during the pandemic: (1) Nurses' feelings and responses: including early psychological stress and physical discomfort during the pandemic, adaptation and conflicts in isolation management during the rebound period, and later medical resource shortages. (2) Work achievements: covering a sense of mission, personal growth, and recognition. (3) Difficulties and challenges encountered: including initial workflow issues, resource shortages, critical

Yin-Ping Zhang and Meimei Wang are the corresponding authors of this manuscript.

*Correspondence: Meimei Wang 843460177@qq.com Yin-Ping Zhang cathyzh@mail.xjtu.edu.cn

Full list of author information is available at the end of the article



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article are provide in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by-nc-nd/4.0/.

care management gaps, communication barriers during the rebound period, and a decline in staff morale. (4) Training issues: rushed early training, limited content, lack of process and details during the rebound period, inconsistent standards, and lack of enthusiasm for participation. (5) Training improvement recommendations: suggesting an emphasis on training content, reasonable scheduling of training time, various forms of training, multiple assessment methods, and establishment of human resource reserves.

Conclusion These findings reveal the challenges faced by frontline nurses during different phases of the pandemic, emphasizing the necessity of comprehensive and systematic nurse training programs. Recommendations include regularly updating training content, enhancing communication and psychological intervention training, diversifying training formats, establishing a mechanism for continuous learning, and exploring personalized training plans to improve nurses' preparedness in future public health crises.

Key Words Frontline nurses, Pandemic control policies, Isolation wards, Emergency preparedness, Pandemic response experiences, Psychological stress, Training reflections, Communication barriers, Training improvement

Introduction

The rapid spread of the COVID-19 pandemic has escalated into a major global public health crisis. In the early stages of the pandemic, China implemented stringent containment measures, including the lockdown of Wuhan and nationwide restrictions [1]. These unconventional control measures effectively halted the spread of the virus and significantly reduced the mortality rate [2, However, the trajectory of the pandemic was non-linear, with sporadic outbreaks and intermittent resurgences in different regions over time. At this stage, the control strategies shifted from broad restrictions to more precise control and monitoring measures, such as localized lockdowns, contact tracing, and widespread nucleic acid testing [4]. By 2023, the government had lifted all restrictions, resulting in a surge of patients flooding into hospitals and placing immense pressure on the healthcare system. Following this period of extensive infection, society gradually returned to normalcy. Throughout the pandemic, healthcare workers, especially nurses on the front lines, remained the backbone of the response efforts, facing unprecedented challenges. Their experiences under various pandemic control policies offer valuable insights into medical responses under crisis conditions, warranting further exploration.

The pandemic exposed many countries' deficiencies in dealing with public health emergencies, especially the limited emergency response capacity among healthcare workers. Early cross-sectional surveys found that most nurses involved in the pandemic response lacked experience and preparedness, showing inadequate emergency response capabilities. Furthermore, they faced various psychological issues, with an insufficient grasp of ethical and legal knowledge, limited opportunities for scenariobased training, etc [5-10]. These surveys targeting frontline nurses mostly utilized standardized questionnaires or scales to collect data, providing statistical analyses on issues within the nursing community, and revealing overall trends and significant differences [11]. However, such quantitative approaches typically overlooked individual experiences and emotional nuances [12-14]. In contrast, qualitative studies, which employed in-depth interviews and other methods, enabled a more comprehensive understanding of nurses' personal experiences and genuine emotions in extreme work settings [15]. This approach provided actionable insights for developing targeted support and training programs, aligning with the recommendations of both the World Health Organization and the Centers for Disease Control and Prevention [4, 15]. Thus, quantitative studies can provide essential data support for emergency responses, while qualitative studies could delve deeply into individual subjective experiences and emotions, contributing to the development of comprehensive and humane public health policies.

Existing qualitative research has predominantly focused on frontline nurses during the pandemic's initial stages, examining their experiences in COVID-19 wards [14, 16-21], psychological impacts [22], and ethical dilemmas [23, 24]. These studies highlighted the significant psychological impact on nurses, including fear, anxiety, depression, and social isolation [14, 20, 22]. They also detailed challenges related to fluctuating workloads, work processes, and shift patterns [25]. The findings emphasized the importance of supporting nurses' mental health, addressing personal protective equipment shortages, fostering a good communication environment, and providing adequate support and training for frontline healthcare personnel [16, 18, 26, 27]. However, most research concentrated on immediate responses during the outbreak, addressing immediate challenges and experiences while lacking systematic exploration of dynamic adaptation processes over time. In the context of evolving pandemic control policies, there remained a deficiency in in-depth discussions about nurses' experiences and challenges at different stages of the pandemic. Thus, there was an urgent need for studies exploring experiences across various stages of epidemic control to reveal

how changes in nurses' roles and experiences affected the adaptability of nursing practice.

This study may address the shortcomings in the existing literature by exploring nurses' real experiences, challenges, and coping mechanisms in response to the constantly changing pandemic policies, thus bridging this gap. By meticulously documenting and analyzing the changes in nurses' roles and experiences, we will gain a deeper understanding and analysis of the evolution of nurses' work experiences throughout different stages of the pandemic. These insights can provide a crucial understanding of the resilience of the healthcare system and emergency preparedness, aiding in the improvement of nursing management and the formulation of future health policies. Additionally, the occurrence of the pandemic exposed inadequacies in emergency response, resource allocation, and personnel training within the healthcare system [5, 19, 21, 28]. Future research should delve into nurses' coping strategies during crises, how training programs can be improved, and analyze the long-term impacts of these experiences [19, 22, 29]. Identifying the current shortcomings of training and future needs can enhance the training system and cultivate human resources with comprehensive abilities. Therefore, a thorough analysis of frontline nurses' experiences at different stages of pandemic control policies, as well as a reflection on the nursing training system, holds significant practical importance for understanding the comprehensive needs of nursing personnel during the pandemic, supporting their professional development, and refining the training system.

This study aims to delve into frontline nurses' work experiences and challenges at different stages of pandemic control policies through qualitative methods, identifying and analyzing their perspectives, and interpreting them. Furthermore, it reflects on the inadequacies of existing training programs and explores how their experiences can inform future training initiatives to provide recommendations for improvement. This could provide a scientific basis for enhancing emergency preparedness and help nurses better address potential future pandemic challenges.

Methods

Participants and eligibility

Recruitment information was widely disseminated in various WeChat groups dedicated to academic exchanges in infectious disease nursing across the country, along with details regarding the interview topics and recruitment criteria, to solicit nurses willing to participate in the interviews. These WeChat groups, spontaneously formed by infectious disease nursing professionals across the country, aim to facilitate the sharing and discussion of specialized knowledge. The members primarily consist of infectious disease nurses, nursing managers, and academic researchers involved in infectious disease care, many of whom have experience in frontline pandemic response. Researchers were permitted to post relevant online recruitment information in these groups after obtaining approval from the group administrators. This recruitment method was adopted to ensure the recruitment of participants most likely to understand the frontline nursing phenomena of pandemic response. To enrich the obtained data, frontline nurses with diverse ages, educational backgrounds, positions, support locations, and experiences in coping with COVID-19 during various phases were selected. The eligibility criteria for participants were as follows: (1) registered nurses who are employed full-time in China; (2) frontline nurses who have responded to the COVID-19 pandemic; (3) willing to share their experiences and perspectives in frontline nursing work; (4) able to understand and communicate in Mandarin Chinese.

We received responses from 15 nurse managers or nurses in tertiary hospitals. After initial interviews, we selected 5 qualified and willing nurses for further interviews. Following the snowball sampling approach, after the interviews, interviewees were asked to recommend other nurses meeting the specified criteria for continued interviews. To determine the sample size, we continued the interviews until the interviewee data was repeated and no new themes emerged, reaching saturation [30, 31]. Ultimately, a total of 24 nurses participated in the interviews. These interviewees were from 5 tertiary hospitals in Hunan Province (including 2 in Hengyang, 1 in Shaoyang, 1 in Xiangxi Autonomous Prefecture, and 1 in Xiangtan), with an additional hospital situated in Qingyuan, Guangdong Province, and another in Urumqi, Xinjiang Uyghur Autonomous Region. The entire interview spanned two months, conducted between April and May of 2024.

Study design

This study employed a qualitative descriptive design to comprehend the authentic experiences and insights of nurses working in isolation wards during the pandemic from a naturalistic perspective. Such an approach allowed for an in-depth exploration of individuals' sense of belonging in a natural environment, offering rich descriptions of unknown phenomena, focusing on the lived experiences of the subjects, and revealing the general essence of a phenomenon [32, 33]. By understanding the perspectives of insiders on experiences, events, and interactions, this study delved into the insights and phenomena of nurses during the pandemic, aiming to capture their professional capabilities, performance in frontline pandemic response, and reflections on challenges and difficulties faced. Moreover, it examined their attitudes towards current training and evaluated its effectiveness, identifying potential training needs in the future. Through these efforts, the aim was to provide comprehensive support and training opportunities for nurses to enhance their efficiency and effectiveness in future pandemic responses.

Design questions

The interview content for this study was specifically developed to align with its objectives. Initially, the research team conducted a comprehensive literature review, drawing on multiple qualitative studies of nurses' psychological and work experiences during the COVID-19 pandemic [6, 10, 19, 20, 25]. To ensure the scientific rigor and relevance of the interview, we consulted three expert nurses who have worked in the infectious disease department for over ten years and have participated multiple times in responding to various epidemics. Following discussions within the research team, a preliminary interview outline was developed.

Before conducting the formal interviews, preliminary interviews were conducted with two nursing staff members who had been working in isolation areas for over a month. Based on their feedback, we revised the initial interview outline, which was finalized through expert nurses' discussions. The interview outline comprises two main topics and four specific interview questions, as outlined in Table 1.

These questions helped gain a deeper understanding of nurses' work experiences and challenges during the pandemic and their future training needs, to better support and provide resources for frontline nurses.

Data collection

This study collected data through semi-structured interviews, mainly using face-to-face individual in-depth interviews, supplemented by interview notes and reflective journals. Researchers conducted face-to-face interviews locally, while remote participants engaged via WeChat video or voice calls. The entire interview process was recorded, with each interview lasting 45 to 60 min. To maintain respect for participants' preferences and ensure no disruption to their normal work, interview times and locations were flexibly arranged in quiet surroundings to ensure participant comfort. Follow-up inquiries were made when potential participants declined involvement. Common reasons included scheduling conflicts, discomfort with discussing pandemic-related experiences, and concerns about privacy despite assurances of confidentiality. By understanding these hesitations, the study was better positioned to support those who did participate.

The interviews were scheduled flexibly in quiet surroundings post-working hours, respecting participants' preferences and ensuring no disruption to their normal work. Each was conducted individually in the participants' workplace rest area to promote open expression. A relaxed atmosphere was fostered pre-interview through casual conversation, where the research purpose was explained and interviewer introductions were made, ensuring participant consent and documentation. During interviews, consideration for the participants' psychological support was emphasized. Given the sensitivity of pandemic experiences, researchers were trained in active listening and provided reassurance through attentive observation of non-verbal cues like facial expressions and body language. Comfort during pauses or emotional moments was prioritized, with interviewers employing techniques such as listening, probing, and summarizing to deeply comprehend their experiences. Post-interview, participant feedback was solicited, including the openness to follow-up interviews and result verification.

Data analysis

When processing the data, Giorgi's phenomenological analysis method was utilized [34], and classification coding and thematic extraction were carried out with the assistance of NVivo 12.0 software. Overall, the data analysis in phenomenological research aims to reveal the relationships between themes by encoding, analyzing, and interpreting phenomena, extracting themes and essences. Giorgi's method first focuses on analyzing the essential experiences of each case and then synthesizes them after describing the contextual structure of

Table 1 The semi-structured interview outline and questions

Number	Questions							
Topic 1 Experiences and challenges of nurses' working on the frontline during the pandemic								
1	Can you share your primary experiences and overall feelings about working on the frontline during the pandemic response?							
2	While working in isolation wards, what physiological or psychological difficulties and challenges have you faced? Please describe these experiences in detail.							
Topic 2 Nurses'	training experiences and future training needs							
1	What types of training have you received before working in isolation wards? How have these trainings impacted your actual work?							
2	What do you think are the strengths and weaknesses of the existing training programs? Regarding future training measures, what suggestions do you have to better support frontline nurses? Please provide specific details.							

the cases, ultimately forming a description of the overall structure. The specific steps of the analysis (see Fig. 1) are as follows:

Firstly, after each interview, the interview data was transcribed by the researcher within 24 h. The transcribed interview data was repeatedly read to identify potential themes and establish a coding outline. The initial coding was directly derived from the text itself, ensuring the originality and accuracy of the coding process. By importing the text into NVivo 12.0 software, we utilized its features to extract high-frequency keywords, phrases, sentences, and paragraphs, forming the basis for preliminary coding and categorization. This phase also encompassed the removal of overlapping, ambiguous, and complex categories to enhance the efficiency of the coding framework.

In the second step, researchers repeatedly read through all other interview data and further refine the themes based on the coding outline. At this stage, regular discussions with another researcher were conducted to revise the coding system to enhance accuracy.

The third step involved further refining themes and categories, including those that appeared unrelated to the research questions. Subsequently, reflecting on the interviewees' thoughts, feelings, and reactions, preliminary descriptions of each category and theme were formed, exploring the phenomenon of the study and the relationships between the various elements of the phenomenon.

Next, integrating the previous steps, the final data was returned to the research subjects for content validity verification, presenting a general, structured description and interpretation of the phenomenon based on the researcher's analysis of the data and the synthesis of individual experiences. In this method, researchers analyzed the data with an open mindset, coding the content one by one, with the interviewees' language as the primary form of expression. Additionally, in the formation of theories, the main categories of theory were extracted from the research data to avoid personal views and attitudes from interfering.

Table 2 provides an example that illustrates our extraction of the high-frequency term "stress" using NVivo 12.0 software. This term represents our preliminary coding of the related texts, and subsequently, we further explored and refined the themes around this keyword.

Trustworthiness

The four criteria used to evaluate qualitative research are credibility, transferability, dependability, and confirmability [35]. To enhance the credibility of the study, researchers rigorously designed the research plan according to the research objectives, actively participated in interviews, and spent 2 months on data collection. Two researchers dedicated 3 months to transcribing, editing, and analyzing the data, incorporating participant feedback, expert reviews, and document analysis. A third research member participated in data verification to enhance data accuracy. The entire data analysis phase was reviewed by two qualitative research experts with nursing backgrounds who provided coding revision suggestions. An external doctoral reviewer in health psychology conducted peer reviews to ensure the reliability and consistency of the results. To increase transferability, the study employed various strategies, including simultaneous data collection and analysis, result comparisons, and detailed reporting for consistency and comprehensiveness. To ensure confirmability, a detailed research procedure report was provided, covering demographic characteristics, sampling methods, and data collection approaches. The research process was meticulously documented, with members checking interview records and coding accuracy to ensure that the research findings were data-driven, guaranteeing the reliability and traceability of the study results. These measures enhanced the scientific rigor and applicability of the research methodologies.

01 Read repeat determine the theme, and coding outli	01 Read repeatedly, determine the initial theme, and establish a coding outline.		es and	05 The analyzed provided to the interviewees validation.	data was he for	07 Develop structured descriptions and interpretations of the phenomena.	
	02 Further refin theme and re coding syste	e the vise the m.	04 Formulate ini descriptions a relationships	tial und for each	06 Analyze data synthesis wit experience.	and h personal	

category and theme.

Table 2 Examples of coding and theme extraction

Initial Coding	Quoted Participants' Responses	Further Coding	Sub-themes	Themes
Stress	M5: The stress is greater when entering the quarantine area for the first time, especially in terms of mental strain. Since I have not dealt with such patients before, I feel scared and anxious about the possibility of getting infected. Additionally, I worry about not performing my job well, which makes me feel guilty for living up to everyone's trust.	The threat of infection Problems arising from a lack of experience	(The early stages of the pandemic) Psychological stress	Feel- ings and re- spons- es
	M8: When I first provided support in Hubei to respond to COVID-19, the stress primar- ily arose from the unknown fears surrounding the virus.	The threat of infection		
	M19: After working for an extended period in the isolation ward, I experienced dizzi- ness and chest tightness, along with excessive psychological pressure.	Symptoms of Physical discomfort	Physical discomfort	
	M19: In the early stages, the lack of experience, unreasonable division of responsibili- ties, insufficient manpower, and issues with protective measures and layout contrib- uted to the heavy workload, leading to difficulties and stress.	Problems arising from a lack of experience	Lack of experience	
	M12: The stress originates from the requirements for zero infection control and the potential pressure of policy and public opinion; if I become infected, I fear criticism, but I am not afraid of the disease itself (Rebound period).	High standards for zero infection control	(Resurgence of the pandemic) Policy pressure	
	M9: There was also pressure to soothe the patients' emotions to prevent chaos and the occurrence of emergencies, such as patients attempting to escape from the mobile clinic. (Rebound period)	Responses to escaping from quarantine facilities	Isolation management conflict	
	M9: During the second support operation in the city of CQ (location code), the stress mainly stemmed from difficulties in communication and logistics coordination. A significant amount of time was required for coordination, including setting up the mobile clinic, arranging personnel, and coordinating supplies, while also needing to quickly familiarize oneself and make reasonable arrangements with personnel from different units. (Rebound period)	Difficulties in com- munication and coordination	(Resurgence of the pandemic) Communica- tion barriers	Difficul- ties and chal- lenges

Ethics approval and consent to participate

This study has been approved by the ethics committee of Affiliated Nanhua Hospital, University of South China (project number 2024-KY-075). This study complies with the principles outlined in the Declaration of Helsinki. Upon inviting nurses to participate, comprehensive information regarding the research objectives, significance, and approximate interview duration were communicated. It was explicitly stated that participants had the right to refuse involvement or withdraw at any time without facing unfair treatment. To enhance comfort, participants were informed of the interviewer's identity before the session, ensuring confidentiality and affirming that their responses would not impact their employment status. By maintaining no personal relationship between participants and the interviewer, bias is reduced, establishing a neutral environment. Participants were notified that the interviews will be recorded, and transcribed by the researchers, and the audio data would be de-identified to protect their privacy. Furthermore, participants would be provided with procedures to report any disclosures of poor practice during or after the interview process. They can report such concerns anonymously through a designated hotline or email, ensuring their issues were addressed appropriately and without fear of repercussion. Before the interviews, participants must be fully informed and willing to participate, and they were required to sign a written informed consent form. All data would be securely stored on the researcher's encrypted personal devices and hard copies would be securely kept. The data would be solely used for this study.

Results

Demographic data

This study involved 24 nurses predominantly female, with a variety of roles and educational backgrounds. The participants included a director nurse, seven head nurses, and sixteen nurses. Their ages ranged from 27 to 46 years, and their nursing experience varied from 3 to 28 years. Their experience working in isolation settings spanned from 40 days to 3 years. See Table 3 for details.

The main themes and sub-themes

In the thematic analysis of the transcription material, five main themes and 27 subcategories were identified. The following section would provide a detailed explanation of these categories. For an overview, refer to Fig. 2.

Nurses' feelings and responses at different stages of pandemic control policies

The early stages of the pandemic - nationwide restrictions

(1) **Psychological stress** Respondents expressed widespread fears related to infection, death, inexperience, and anxiety about unfamiliar environments.

• The threat of infection and death Participants expressed a pervasive fear of infection and death, par-

NO.	Gender	Age (years)	Position	Professional Title	Degree	Experi- ence (years)	Department	Duration of work in the isola- tion ward
M1	Male	31	Nurse	Intermediate	Bachelor's degree	9	Infectious Disease	112days
M2	Female	33	Nurse	Intermediate	Master's degree	10	Orthopedic Surgery	76days
M3	Female	33	Head nurse	Intermediate	Bachelor's degree	11	Fever Clinic	1 years
M4	Male	27	Nurse	Primary	Bachelor's degree	4.5	Infectious Disease	192days
M5	Female	31	Nurse	Intermediate	Bachelor's degree	10	Traditional Chinese Medicine	56days
M6	Female	40	Head nurse	Intermediate	Bachelor's degree	21	Pediatrics	42days
M7	Female	39	Nurse	Intermediate	Bachelor's degree	18	Infectious Disease	45days
M8	Female	35	Nurse	Intermediate	Bachelor's degree	11	Emergency	75days
M9	Male	29	Nurse	Primary	Master's degree	3	Operating Theatre	107days
M10	Female	39	Nurse	Intermediate	Bachelor's degree	18	Respiratory	98days
M11	Female	43	Head nurse	Senior	Bachelor's degree	19	Respiratory	85days
M12	Female	43	Head nurse	Senior	Bachelor's degree	21	Infectious Disease	5months
M13	Female	41	Nurse	Senior	Bachelor's degree	22	Hospital Infection-Control	115days
M14	Female	31	Nurse	Intermediate	Bachelor's degree	18	Respiratory	49days
M15	Female	40	Nurse	Intermediate	Bachelor's degree	18	Hemodialysis Room	2years
M16	Female	35	Nurse	Intermediate	Bachelor's degree	4	Nursing Management	40days
M17	Female	29	Nurse	Primary	Bachelor's degree	6	Infectious Disease	5months
M18	Female	27	Nurse	Primary	Bachelor's degree	5	Infectious Disease	40days
M19	Female	46	Head nurse	Primary	Bachelor's degree	28	Infectious Disease	8months
M20	Female	38	Head nurse	Intermediate	Bachelor's degree	15	ICU	6months
M21	Female	39	Director nurse	Senior	Doctor's degree	10	Nursing Management	5months
M22	Female	29	Nurse	Intermediate	Bachelor's degree	8	ICU	3years
M23	Female	35	Head nurse	Intermediate	Master's degree	10	Oncology	45days
M24	Female	34	Nurse	Intermediate	Bachelor's degree	12	Gastroenterology	4months

_			-							•			
12	h	•	- 2	_ I	lon	\sim	a	1	nr			2	tっ
10				- L -						110		0	ıа
		-	-	_	· • · ·		~	~	<u> </u>	· · · •	-	~	~~~

ticularly regarding the heightened risk while caring for critically ill patients. Respondents M6 and M9 reported that the daily occurrence of patient fatalities in the Intensive Care Unit (ICU) created a tense atmosphere. M20 highlighted the lack of protective gear for nurses caring for critically ill patients, noting that isolation gowns were worn and urinary catheters were used as substitutes for suctioning patients, presenting a significant infection risk. Concerns also extended to the potential of infecting family members (M3, M7, M11) and the anxiety over the inability to care for loved ones (M20). Reports of high mortality rates, ambiguous routes of transmission, and insufficient protection among colleagues exacerbated anxiety (M5, M16, M17, M18, M24). M24 specifically mentioned, "five colleagues exhibiting abnormal lung CT scans, which caused panic."

②Lack of experience Many nurses reported elevated anxiety levels stemming from their inexperience with crises. Concerns regarding potential mistakes (M16, M23) and subpar job performance (M1, M5, M8) were pervasive. The abrupt transition to frontline duties after minimal training left some nurses feeling unprepared (M16, M19, M23). Nurse M1 expressed apprehension that

insufficient attention to task details could facilitate the spread of infections. Furthermore, M22 indicated a lack of experience in hospital infection prevention and control, emphasizing the need to learn on the job to close the knowledge gap.

③Unfamiliar environment, the temporary team needed to adapt Many nurses faced significant challenges in adapting to temporary work environments. Feelings of confusion, unease, and being somewhat lost were expressed by those working in makeshift isolation wards (M1, M8, M20, M23). They reported difficulties in adjusting to new roles and interacting with unfamiliar colleagues (M19), which further heightened their stress levels (M6, M15). Issues with team integration and communication among colleagues were also noted (M2), along with varying proficiency levels within temporary teams (M6, M15, M18).

(2) Exhaustion Respondents collectively reported feelings of exhaustion due to staff shortages, high patient numbers, and heavy workloads.

M20 described working tirelessly to fill all 110 hospital beds within 48 h. Some colleagues collapsed from



Fig. 2 Overview of themes in experience and training analysis of frontline nurses

exhaustion but continued despite illness (M20). Staff shortages and overwhelming workloads, particularly during evening shifts when patient intake surged, left many near exhaustion (M1, M2, M12, M16, M21). The sudden influx of patients created a chaotic work environment, compounded by long hours and inadequate staffing, resulting in disarray (M17, M19).

(3) **Physical discomfort** Respondents frequently reported physical discomfort from wearing protective equipment for extended periods.

Many attempted to minimize water intake and restroom breaks to conserve the use of their gear. Symptoms such as dizziness, chest tightness, and shortness of breath were common (M4, M5, M9, M11, M17, M19). Severe discomfort included heat strokes and dehydration from protective clothing (M10, M17) and pain or facial injuries from tight mask straps (M9, M17, M19, M21). M17 also reported that long-term isolation could lead to dietary discomfort, while M20 highlighted the challenges faced by women during menstruation and healthcare workers experiencing diarrhea, as they found it difficult to change soiled diapers while continuing to work.

Pandemic rebound period - precise containment

(1) Adaptation Nurses noted improvements in efficiency and teamwork as experience and familiarity increased. Nurses reported that lessons learned from early responses,

along with the availability of sufficient resources, alleviated their stress (M1, M11, M12). This accumulated experience led to smoother operations and fewer challenges, enabling more effective time management and resource allocation (M5, M1, M2, M11, M4, M9, M18, M21). As their capabilities improved, coping strategies became more refined (M4, M9, M18, M21).

(2) Isolation management conflict Managing uncooperative patients created complex challenges, heightening workplace tensions. Participants' feedback indicated that some patients were noncompliant with isolation measures, which led to unrest in the wards (M23). Specifically, patients exhibited resistance to isolation, including demands to lift the isolation and seek economic compensation (M7). As policies extended, frustration and irritability grew among patients, complicating management (M3) and prompting some residents to protest (M8). Against this backdrop, the residents questioned the necessity of external support, further leading to a reduction in patient cooperation (M10, M13). To address the chaos, staff had to soothe patients' emotions and prevent escape attempts (M9). Especially occurred on the eve of the announcement of the full lifting of restrictions, when patients in the isolation point suddenly rushed out, resulting in a serious incident where staff were nearly assaulted (M17). This series of events not only reflected the challenges of isolation management but also highlighted the importance of addressing patients' psychological state and emotional management during the implementation of isolation measures.

(3) Policy Pressure: Strict zero hospital-acquired infection requirement The implementation of zero hospital-acquired infection policies placed considerable pressure on healthcare workers, especially with the frequent inspections conducted by local authorities. For example, one participant explicitly stated, "Local authorities strictly demand that there should be no healthcare workers infected with COVID-19 in hospitals," which placed tremendous pressure on the staff (M12). There was also potential public opinion pressure; for instance, one participant expressed, "If I were to be infected, I would fear criticism rather than the disease itself" (M17, M19). Additionally, the increased frequency of inspections added to the pressure experienced by healthcare workers. As participants pointed out, "We operate under high-pressure conditions, fearing that mistakes might lead to hospitalacquired infections and subsequent punishment," and "Numerous inspections organized by higher authorities further exacerbate this pressure" (M7, M13).

While this policy aimed to enhance the safety of healthcare workers, it inadvertently exacerbated the stress faced by frontline staff. By situating these findings within the broader context of policy demands, we gained a deeper understanding of the challenges that frontline workers confronted daily.

The later stage of the pandemic - a comprehensive lifting of restrictions

The severe shortage of medical resources The comprehensive lifting of restrictions in January 2023 resulted in a serious shortage of medical resources, overwhelming healthcare personnel who faced an unprecedented influx of patients. "The highest record I experienced was four nurses who received 67 patients in one hour, instantly filling up a ward. Just one night filled the patients of two hospital buildings. We worked from the day shift to the night shift, there was no one to take over" (M19). "Our temporary hospital with 12 compartments and warehouses suddenly accommodated several thousand patients, with limited resources" (M9). "The hallways were filled with beds, and new patients continued to pour in. Even the pediatric and obstetric departments were forced to take in adult COVID-19 patients." (M6). Among the severe shortages, "ventilators became the scarcest equipment"(M11). Many elderly patients with severe lung symptoms had to rely on nasal cannula oxygen while waiting for ICU beds (M1, M3, M19, M23). Additionally, a large number of medical staff were infected and continued to work despite experiencing high fevers and body aches. M4, M13, and M22 stated, "We took turns receiving IV fluids or medication and then continued to work. This intense period lasted for two months, testing the limits of our physical and emotional endurance."

Achievements of nurses during work

The achievements of nurses during their work can be seen through their sense of mission, personal growth, and the admiration and recognition they have received. Each nurse's contribution reflects their dedication during the pandemic.

(1) Sense of mission and responsibility

Nurses expressed a profound sense of mission and responsibility in their contributions to the pandemic response. Their experiences revealed a collective commitment characterized by duty, resilience, and a willingness to serve.

Participants shared their strong sense of duty. M2 and M9 stated, "It was my duty; when the pandemic emerged, I went to Wuhan without hesitation." M13 added, "In deciding to fight COVID-19, the country needed me; this was my responsibility and mission." The significant impact of their roles was evident in sentiments like M7's: "Supporting the frontline multiple times gave me a unique work experience and a sense of mission." M10 reflected on the emotional burden: "Supporting Hubei

for the first time, I felt the weight of responsibility." This awareness of duty drove nurses to face challenges: "I strived to overcome various difficulties, knowing the responsibilities I carried" (M16). Despite challenges, participants shared a common courage: "Though it was ordinary work, we were courageous in fulfilling our duties" (M14). M11 mentioned, "Supporting Wuhan, I understood the mission's hardships and the power of unity." M20 summed it up: "We were not heroes; this mission had been bestowed upon us by the times, representing a responsibility we must fulfill."

(2)Personal growth Nurses have experienced profound personal and professional growth during the pandemic, highlighted by Professional capabilities enhancement, resilience, and emotional insight.

Professional capabilities development: Participant M1 stated, "In multiple pandemic relief missions, I gradually adapted to the work pace, improving efficiency and experiencing the hardships of work, resulting in valuable experience and growth." This adaptation was echoed by Participants M4 and M5, who noted, "Each relief mission served as an opportunity for personal development." "This process honed both my professional skills and teamwork capabilities." Leadership and crisis management enhancement: As nurses adapted to their roles, they also developed critical skills in leadership and crisis management. Participant M6 observed, "Adapting to sudden situations and overcoming challenges enriched my clinical work experience and enhanced my leadership skills and crisis management abilities." This growth was recognized by Participants M15 and M21, who revealed that "the integration of personal growth with professional development was a significant achievement." Resilience and emotional insight: M19 reflected, "Facing challenges and pressure while maintaining a positive attitude was crucial in overcoming difficulties and achieving selfbreakthroughs. " This mindset was further reinforced by Participant M2, who shared, "Taking on the challenge of caring for critically ill patients helped me understand the fragility of life, strengthening my confidence and proficiency in work " (M8, M12).

(3)Admiration and recognition The admiration and recognition received by healthcare workers underscored their critical contributions during a national crisis.

Personal pride and recognition: Many participants expressed profound personal pride derived from their roles during the crisis. Statements such as "I felt honored to receive recognition for my work abilities" (M8) and "I could make a small contribution during the national crisis, which filled me with pride" (M21) illustrated this sentiment. Social gratitude and acknowledgment: Many healthcare workers experienced overwhelming gratitude from the public. M13 expressed, "Expressions of gratitude to us were continuously broadcast on the return flight", and others noted they received similar acknowledgments through building friendships with local healthcare workers and receiving commendations from government officials. Family and community support: Participants also cited substantial support from their families, which bolstered their morale. M11 shared, "Supported by my family, my children referred to me as their 'heroic mom fighting the monsters, and my father was proud of me." Unity and Hope: The collective experience of dedication and unity among healthcare staff was prominent. Participants reported "showcasing the spirit of dedication and sincerity of the medical staff" and contributing to hope in patients (M20, M11). This unity extended to national support, with M13 citing gratitude for "the unwavering support of the country, and as a Chinese citizen, I felt fortunate."

Difficulties and challenges in nursing work

Overview of challenges during the pandemic In the early stages of the pandemic, nursing staff faced numerous difficulties, primarily due to inefficient processes, a lack of protective equipment, inadequate critical care training, and incomplete treatment plans. A resurgence of the pandemic brought about new hurdles, primarily involving communication barriers and a decline in health-care staff motivation.

The early stage of the pandemic

- (1) **Inefficient Processes**: One participant noted that transporting patients for CT scans necessitated extensive coordination across multiple departments, resulting in delays (M4).
- (2) Lack of Personal Protective Equipment (PPE): Several nurses expressed concerns about performing invasive procedures without adequate PPE specifically during suctioning—and highlighted the shortcomings of temporary wards, which were often devoid of essential resources and emergency supplies (M4, M8).

(3) Inadequate critical care M6 and M7 reported unfamiliarity with critical equipment, citing limited experience with blood gas analyzers and ventilators. M18 Concerns were also raised about insufficient training in urgent procedures, such as tracheal intubation.

(4) **Incomplete treatment plans** The treatment plan needed to be adjusted through trial and error. Participants described encountering poor treatment efficacy, disease worsening, and sudden cardiovascular events during this adjustment process.

	Theoretical knowledge	Skills	Others
Content	Isolation zone division and layout	Personal protective equipment	Emer-
	Workflow of patient discharge and admission	Hand hygiene	gency
	Preparation before entering the makeshift hospital	Nasopharyngeal swab collection	response
	Disinfection, isolation, and sterilization	Environmental surface and wastewa-	for
	Basic knowledge of infectious diseases	ter sampling	sud-
	Infection prevention and control	Patient excreta collection	den
	Updated diagnosis and treatment guidelines for COVID-19	Respiratory exercises	events
	Disposal of medical waste	High-flow oxygen therapy	Psy-
	Deal with occupational exposure	Basic settings of non-invasive	cho-
	Outbreak monitoring, information collection, and reporting	ventilators	logical
	Current pandemic situation and work requirements	Ventilator management	testing
		Cadaver handling	
Time	Varies from 1 to 2 days up to 1 week		
Methods	On-site training or online lectures		
Assessment	On-site assessment or online assessment through recorded videos		

Table 4 Training received by nurses interviewed before entering the isolation ward

Pandemic rebound period

(1) **Communication barriers** Language barriers frequently lead to communication difficulties. M12 and M14 noted that "most local villagers did not understand Mandarin, and we were also unfamiliar with the local dialect, resulting in significant communication challenges." M21 emphasized that effective communication regarding nucleic acid testing, isolation policies, and transportation arrangements was essential when managing incoming and outgoing individuals from international sources; these multilingual discrepancies further complicated communication.

Additionally, M9 mentioned that coordination and communication required considerable time, including the establishment of makeshift hospitals, personnel and resource arrangements, and addressing patients' emotional needs. To prevent confusion and effectively respond to sudden situations, it was crucial to quickly familiarize oneself with personnel from different units and make rational arrangements (M7). M14 also highlighted the difficulties in communicating with superiors, particularly when requests for additional personnel, due to heavy workloads, were denied because management lacked a clear understanding of the actual situation.

(2) Decline in staff motivation Prolonged isolation has resulted in a significant decline in staff motivation (M3). According to M9, some staff members demonstrated involuntary participation and passive behavior, while M18 emphasized the need to invigorate temporary teams and ensure effective management of nursing personnel. Addressing these motivational challenges was crucial for maintaining operational efficiency and promoting staff well-being.

Training: limitations and deficiencies

Overview of Respondents' Views:

Participants expressed concerns about the inadequacy and rushed nature of initial training, although improvements were seen during the pandemic resurgence period. Key issues highlighted included insufficient process details, lack of specialized training, inconsistent standards, and a lack of engagement.

Inadequacies during the early pandemic

All 24 participants received brief emergency personal protective equipment (PPE) training before being placed into isolation zones for work. However, this training was hastily conducted, with limited content, leaving participants feeling underprepared for the challenges they faced.

Improvements and deficiencies during the continued pandemic

With the pandemic's progression, training efforts expanded and improved (see Table 4). Despite this progress, several key deficiencies remained evident:

(1) Insufficient process and skill details Many participants reported gaps in understanding critical procedures, such as the isolation area workflow (cited by M1, M10, M11). There was a notable lack of mastery in personal protective measures (mentioned by M1, M7, M8, M10, M16, M23), disinfection and isolation procedures (noted by M1, M8, M13), and medical waste management (highlighted by M3, M11).

(2) Lack of relevant training programs (a) Specific skill shortages were identified in areas including pulmonary function assessment (M14), pediatric blood drawing (M2), and managing pediatric emergencies such as high fever convulsions (M23). (b) Competence issues with critical patient care tasks involved difficulties with ICU equipment (M5), emergency intubation (M18), ventilator management (M9, M19), and emergency response

coordination (M21), hemodialysis (M9), venous catheterization, ultrasound (M8), and more. (c) Emergencies, such as team members urgently leaving the cabin of the makeshift hospital and assisting colleagues suffering from heatstroke or dehydration, were inadequately addressed in training (noted by M5, M11, M12). (d) Other lacking training areas included psychological support skills for patients and their families (M4), nurse mental health resources (M24), communication skills, and special care needs of psychiatric patients (cited by M3, M8, M14, M16, M21, M22, M18).

(3) Training standards and time constraints Inconsistency in training standards (reported by M2, M8, and M21) and unreasonable allocation of training time were reported (M2, M9, and M11).

(4) Issues with training methods and effectiveness Practical dissatisfaction with training methods and effectiveness was prevalent. Participants found the training dull (mentioned by M2, M7) and lacking in practical application and emergency drills (raised by M10, M6).

(5) Lack of participant engagement Some participants were not voluntary, having been passively assigned, resulting in decreased enthusiasm (M2, M11, M17).

Training improvement recommendations

(1) Training content and focus The respondents generally believe that training content should be continuously updated to encompass a wide range of skills and knowledge to address complex situations.

©Continuous updates should include training on new pandemics (M11, M14, M16, M20, M24) and varied responses to enhance nurses' handling of complex situations (M3, M12, M13).

©Strengthen communication and psychological intervention training to improve nurses' resilience. (M1, M13, M19, M24).

^③Emergency response: Respondents suggested increasing emergency response training for various situations (M11, M7, and M14), emphasizing handling emergencies during staff shortages (M2, M8, M16, and M24).

©Enhance physical fitness to cope with high-intensity work in isolation wards (M13, M20).

(2) **Proper training schedule** Respondents advocated for a well-structured and regular training schedule to improve efficiency.

©Training Duration: Recommended 1–3 days (M6, M7, M16, M17, M23) to 1 week (M4, M5, M12, M13, M18,

⁽²⁾Frequency: Advocated for a regular training mechanism, organizing training once a year, and reinforcing knowledge to ensure preparedness (M2, M7, M10, M12).

(3) **Diversified training formats** Several respondents emphasized diverse training methods to enhance practicality and flexibility.

©Integrate theory, skills, and practical training (M2, M6, and M13), emphasizing practicality and increasing practice in isolating areas and layouts (M1, M14, M22).

©Utilize various training formats such as face-to-face training, online training, competitions, case studies, and simulation exercises (M3, M14), conducted in small groups with group leaders responsible (M2).

^③Regularly conduct simulations for emergency response drills (M1, M2, M3, M9, M10, M14).

⁽⁴⁾Incorporating new technologies such as virtual simulation and artificial intelligence (M7, M12, M13), for flexible and personalized training (M8, M12, M13).

(4) **Diverse assessment and evaluation** Respondents emphasized the need for a comprehensive assessment of nurses' knowledge and skills, along with timely feedback.

©Conduct closed-book exams for theoretical knowledge (M16, M17), assess skills through group exercises followed by on-site assessments and online videos (M4, M17), competitions (M5, M15), and preferably practical operation exercises and scenario simulations to assess emergency response capabilities (M4, M14, M15, M16, M18, M20, M23), to comprehensively evaluate nurses.

[©]Advocate for regular assessments (M11). Recommended providing real-time feedback, and continuously improving to enhance training quality (M5, M13).

(5) **Personnel resource reserve** Some respondents suggested building an experienced backup team and promoting continuous learning through incentive mechanisms.

©Select experienced and well-grounded nurses (M3) who voluntarily participate in training, and reserve those who pass assessments (M2, M10, M11).

©Establish reward mechanisms to motivate trainees to continue learning and maintaining their expertise in pandemic prevention and control (M16).

Discussion

This study focuses on 24 frontline nurses in isolation wards and utilizes qualitative research methods to explore their experiences and feelings during the different phases of pandemic control policies. In-depth interviews and observations identified five key themes: nurses' feelings and responses, work achievements, difficulties and challenges, training issues, and improvement recommendations. These themes authentically described different aspects related to nurses' work during the pandemic, deepening the understanding of the role transitions and adaptations of nurses during different phases of pandemic control. Unlike previous studies focused on early pandemic experiences and challenges, this study captured the evolving pressures such as infection threats, workload, and resource shortages during national restrictions, conflicts in quarantine management and policy pressure during resurgence phases, and severe resource shortages when restrictions were lifted. Additionally, they faced challenges such as communication barriers and declining staff motivation. Despite these adversities, nurses demonstrated a strong sense of mission and responsibility and achieved personal growth. The study also revealed discrepancies in the training received by nurses during different phases of the pandemic. Early training was hurried with limited content and format, while the later training showed improvements but still required enhancements in coverage, depth, and engagement. These findings underscore the need for a more comprehensive discussion on designing training and support systems to enhance nurses' adaptability and resilience. When facing future public health crises, it is crucial to design better nurse training programs, emphasize the establishment of psychological support and communication mechanisms, and improve work environments and resource allocation to enhance healthcare workers' coping capacity and professional satisfaction [14, 18].

During the early stages of the pandemic, nurses faced multiple pressures such as the threat of infection and death, lack of experience, and unfamiliar work environments. The overwhelming workload and physical discomfort made them feel extremely exhausted. Due to a lack of preparation, they had to work with scarce resources and inadequate protective measures, all while dealing with the fear of unclear transmission routes and high mortality rates. Additionally, incomplete work procedures and treatment guidelines exacerbated the challenges they faced. Descriptions of this period aligned with previous research findings [12, 20, 22, 28, 36-39]; however, this study provided a more detailed perspective by examining the sources of stress and their progression at different pandemic stages. Unlike previous studies, we found that although accumulated experience alleviated some stress, new pressures emerged from diagnosed patients not adhering to isolation measures and the government's high standards for zero infections during the rebound of the pandemic. In this context, nurses needed to address challenges related to management, communication barriers, and team motivation [14, 26-28]. The ongoing challenges of compliance and team mobilization underscore the importance of developing advanced strategies to cope with crisis environments. Insufficient training has also affected their ability to overcome these obstacles. Additionally, the lifting of all restrictions at the end of the pandemic led to a surge in infections and patient influx, which, coupled with shortages of manpower and resources, made nursing work more challenging, creating new pressures. Surprisingly, driven by a strong sense of mission and responsibility, the nurses exhibited high professionalism and successfully withstood rigorous tests in the face of enormous stress and challenges. Through practical experience during the pandemic, their coping abilities significantly improved, gaining widespread recognition from society and families [36, 40]. This dedication sparked greater appreciation for their work and reinforced the value of team collaboration. As stated by Gerada [41], "Some good must come out of COVID-19." Detailed phase-wise studies provide valuable insights for optimizing practical measures. These findings enhance management perspectives by enabling healthcare managers to implement interventions targeting challenges specific to particular periods, thus promoting informed decision-making and resource allocation.

Previous studies [36, 42-44] have indicated that the lack of infectious disease experience among healthcare workers is a major obstacle in responding to public health emergencies, highlighting the need to enhance emergency response capabilities through various forms of training. Our study similarly found that during the initial phase of the outbreak, nurses faced challenges such as limited time and a lack of relevant training. Thus, early training primarily focused on basic protective skills in emergency settings. However, unlike previous studies, our research discovered that while improvements were noted in the late stages of training, issues such as inadequate depth and detail of the training remained. By focusing on specific shortcomings, this study highlighted the necessity of diversifying and enhancing the richness of training content. While past research largely concentrated on basic skills, our study emphasized the need for more in-depth learning and detailed attention. Similar to the study by Ya Fan et al. [45], our respondents mentioned that training content was often dull, not practical, and lacking emergency drills, further confirming the inadequacies of the current training methods in practice. To enhance nurses' practical abilities, emergency drills and specific operations should be strengthened [46, 47], with the adoption of diversified training methods and emerging technologies such as virtual simulations and artificial intelligence. This study complemented previous studies by recommending advanced training tools, potentially changing traditional methods, and emphasizing practicality. Additionally, our study identified specific training needs distinct from previous studies: emergency evacuation from a makeshift hospital, assisting in handling colleagues with heatstroke or dehydration, and providing specialized skills and equipment operation training for critical patients and children.

Influenced by the COVID-19 pandemic, greater emphasis is now placed on the mental health and support of healthcare workers, a significant shift from prior epidemics [36, 48]. Research indicated the necessity for psychological interventions and communication skills training [49]. This was particularly notable as participants in our study acknowledged that nurses frequently encountered communication barriers due to language, cultural differences, and insufficient role awareness during their work. This underscores potential weaknesses in the current response tasks of nurses and enriches the existing body of studies. Future studies should incorporate psychological and communication training into training recommendations, aiding in the holistic development of healthcare professionals to meet diverse environments and individual circumstances. Upcoming training programs should prioritize practicality, diversity, and flexible personalization to enhance the response capabilities of healthcare workers.

In addition, a new considered focus includes addressing the issue of involuntary participation in training. It is necessary to select experienced, well-grounded, and voluntary nurses for training, and establish a reserve of such professionals. It is recommended to organize training sessions regularly, at least once a year, to maintain the quality and efficiency of learning. By consistently reinforcing training knowledge, nurses' readiness can be ensured. To achieve this, providing real-time feedback and a reward mechanism is necessary, as this will motivate trainees to continue learning and improving, thereby maintaining their professional competence in pandemic prevention and control. These strategies enhance and reinforce the new framework for effective training and implementation, which is crucial for gradual behavioral change and improving nurses' preparedness.

Conclusion

Through qualitative interviews with 24 frontline nurses from isolation units, this study extracted five main themes during different stages of pandemic control policies: nurses' feelings and responses, job achievements, difficulties and challenges encountered, training issues, and improvement recommendations. The study thoroughly explores the unique challenges that nurses face in different stages, including significant psychological stress and physical discomfort in the early stages, adaptation and conflict management in the rebound period, and severe shortage of medical resources in the later stages. It highlights the dilemmas such as early-stage resource shortages, inadequate protective and treatment procedures, and communication obstacles during the rebound period. Despite nurses showing a strong sense of responsibility and adaptability, and gaining personal growth and societal recognition, issues like decreasing staff motivation and training deficiencies emerged over time.

To better tackle future pandemics, optimizing nursing training mechanisms is advised. This includes regularly updated training content, enhanced communication, psychological intervention, and emergency response training. Training schedules should focus on improving quality and efficiency, encourage diverse formats combining theory with practice, and use virtual and AI technologies for personalized training. Finally, establishing a robust personnel reserve system and incentivizing continuous learning through rewards are crucial for enhancing nurses' preparedness.

Limitations

This study faces several limitations. Firstly, the reliance on qualitative methods and a relatively small sample of 24 nurses is acknowledged as a constraint. However, it is important to note that qualitative research aims to explore phenomena and experiences in depth within specific contexts. Our study adhered to the principle of sample saturation, ensuring the richness and depth of the data. Although the sample size might limit the generalizability of the findings across diverse healthcare settings or different geographic locations, this research still offers valuable and context-specific insights into the experiences of frontline nurses. Secondly, the use of snowball sampling could introduce selection bias, as participants may recommend colleagues with similar experiences and perspectives, potentially reducing the diversity of insights gathered. Furthermore, this study is temporally linked to the stages of pandemic control policies in effect during the data collection period. As these policies evolve, the experiences and challenges faced by nurses may also change, potentially limiting the temporal relevance and applicability of the study's findings to future contexts. Despite its limitations, this qualitative study focuses on the experiences of frontline nurses, identifying key themes from their perspective to provide foundational information for future training and support mechanisms. The study offers significant insights and underscores the necessity for ongoing research in the context of everevolving environments and policies.

Supplementary Information

The online version contains supplementary material available at https://doi.or g/10.1186/s12912-025-02898-0.

Supplementary Material 1

Acknowledgements

We would like to thank all participants in this study and the staff from the Affiliated Nanhua Hospital, University of South China, Affiliated Public Health Hospital, University of South China, The Central Hospital of Shaoyang, Central Hospital of Xiangtan, Qingyuan People's Hospital, affiliated with Guangzhou Medical University, Traditional Chinese Medical Hospital of Xinjiang Uygur Autonomous Region, People's Hospital of Xiangxi Tujia and Miao Autonomous Prefecture, and Xi'an Jiaotong University Health Science Center.

Author contributions

DZ and Y-PZ contributed to the conception and design of the study. YJ, YC, and QL contributed to the study delivery, data collection, and interpretation of the data. DZ, YJ, YC, and QLprepared Tables 1, 2, 3 and 4. YJ, DZ and MW prepared Figs. 1 and 2. DZ, MW, and Y-PZ wrote the main manuscript, and all authors read the final manuscript and approved its submission.

Funding

This study was partially supported by grants from the Fund of Hunan Provincial Department of Education (grant no. HNJG-20230576, to Meimei Wang), the Fund of Hunan Social Science Achievement Appraisal Committee (grant no. XSP25YBC327, to Dandan Zhang), the fund from Hengyang Science and Technology Bureau (grant no. 202010031581, to Dandan Zhang).

Data availability

The datasets generated and/or analyzed during the current study are not publicly available due to participant privacy concerns but are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

This study has been approved by the Ethics Committee of the Affiliated Nanhua Hospital, University of South China (Approval Number: 2024-KY-075). All participants were fully informed and consented to participate.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

¹Institute of Clinical Research, Affiliated Nanhua Hospital, Hengyang Medical School, University of South China, No. 336 Dongfeng South Road, Zhuhui District, Hengyang 421002, Hunan, China
²School of Nursing, Xi'an Jiaotong University Health Science Center, No.76, Yanta West Road, Xi'an 710061, Shaanxi, China

Received: 5 November 2024 / Accepted: 26 February 2025 Published online: 03 April 2025

References

- Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. Lancet. 2020;395(10223):470–3.
- Liu J, Zhang L, Yan Y, Zhou Y, Yin P, Qi J, Wang L, Pan J, You J, Yang J, et al. Excess mortality in Wuhan City and other parts of China during the three months of the covid-19 outbreak: findings from nationwide mortality registries. BMJ. 2021;372:n415.
- 3. The Chinese University of Hong Kong-Tsinghua University joint research Center for Chinese Economy. The economic cost of locking down like China: evidence from City-to-City Truck Flows [https://research-center.econ.cuhk.ed u.hk/en-gb/research/research-papers]
- Meng Y, Wang X, Dong P, Yang Y, Wang K, Yan X, Hu G, Mao A, Qiu W. Comparative analysis of prevention and control measures toward COVID-19 epidemic between Shanghai and Beijing. Front Public Health. 2023;11:1121846.
- Yan X, Liu F, Aertai, Li M. Current situation and influencing factors of nurses' response-ability to public health emergencies of infectious diseases medical institutions at different levels in the medical association. Occup Health. 2022;38(1):89–94.

- Wang J, Zhong Y, Ding J, Chen Q, Jiao J, Huang C. Psychosocial experiences of Front-Line nurses working during the COVID-19 pandemic in Hubei, China: A qualitative study. Front Public Health. 2021;9:780139.
- Labrague LJ. Pandemic fatigue and clinical nurses' mental health, sleep quality, and job contentment during the COVID-19 pandemic: the mediating role of resilience. J Nurs Manag. 2021;29(7):1992–2001.
- Chew NWS, Lee GKH, Tan BYQ, Jing M, Goh Y, Ngiam NJH, Yeo LLL, Ahmad A, Ahmed Khan F, Napolean Shanmugam G, et al. A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID-19 outbreak. Brain Behav Immun. 2020;88:559–65.
- Brewer CA, Hutton A, Hammad KS, Geale SK. A feasibility study on disaster preparedness in regional and rural emergency departments in new South Wales: nurses self-assessment of knowledge, skills, and Preparation for disaster management. Australas Emerg Care. 2020;23(1):29–36.
- Perez-Raya F, Cobos-Serrano JL, Ayuso-Murillo D, Fernandez-Fernandez P, Rodriguez-Gomez JA, Almeida Souza A. COVID-19 impact on nurses in Spain: a considered opinion survey. Int Nurs Rev. 2021;68(2):248–55.
- Barroga E, Matanguihan GJ. A practical guide to writing quantitative and qualitative research questions and hypotheses in scholarly articles. J Korean Med Sci. 2022;37(16):e121.
- Min Z, Li C. A qualitative study of the psychological experiences of isolation ward nurses combatting COVID-19 infection. J Nurses Train (in Chinese). 2020;14(35):1332–6.
- 13. Covid-19-a. social phenomenon requiring diverse expertise [https://www.ids. ac.uk/opinions/covid-19-a-social-phenomenonrequiring-diverse-expertise]
- Akkus Y, Karacan Y, Guney R, Kurt B. Experiences of nurses working with COVID-19 patients: A qualitative study. J Clin Nurs. 2022;31(9–10):1243–57.
- 15. Teti M, Liebenberg EJSL. Methods in the time of COVID-19: the vital role of qualitative inquiries. Int J Qualitative Methods 2020, 19.
- Ozdemir Koken Z, Savas H, Gul S. Cardiovascular nurses' experiences of working in the COVID-19 intensive care unit: A qualitative study. Intensive Crit Care Nurs. 2022;69:103181.
- Jorgensen L, Pedersen B, Lerbaek B, Haslund-Thomsen H, Thorup CB, Albrechtsen MT, Jacobsen S, Nielsen MG, Kusk KH, Laugesen B, et al. Nursing care during COVID-19 at non-COVID-19 hospital units: A qualitative study. Nord J Nurs Res. 2022;42(2):101–8.
- Eftekhar Ardebili M, Naserbakht M, Bernstein C, Alazmani-Noodeh F, Hakimi H, Ranjbar H. Healthcare providers experience of working during the COVID-19 pandemic: A qualitative study. Am J Infect Control. 2021;49(5):547–54.
- Zhang WQ, Montayre J, Ho MH, Yuan F, Chang HR. The COVID-19 pandemic: narratives of front-line nurses from Wuhan, China. Nurs Health Sci. 2022;24(1):304–11.
- Montgomery CM, Humphreys S, McCulloch C, Docherty AB, Sturdy S, Pattison N. Critical care work during COVID-19: a qualitative study of staff experiences in the UK. BMJ Open. 2021;11(5):e048124.
- Conlon C, McDonnell T, Barrett M, Cummins F, Deasy C, Hensey C, McAuliffe E, Nicholson E. The impact of the COVID-19 pandemic on child health and the provision of care in paediatric emergency departments: a qualitative study of frontline emergency care staff. BMC Health Serv Res. 2021;21(1):279.
- Huerta-Gonzalez S, Selva-Medrano D, Lopez-Espuela F, Caro-Alonso PA, Novo A, Rodriguez-Martin B. The Psychological Impact of COVID-19 on Front Line Nurses: A Synthesis of Qualitative Evidence. Int J Environ Res Public Health 2021, 18(24).
- Jia Y, Chen O, Xiao Z, Xiao J, Bian J, Jia H. Nurses' ethical challenges caring for people with COVID-19: A qualitative study. Nurs Ethics. 2021;28(1):33–45.
- 24. Aydogdu ALF. Ethical dilemmas experienced by nurses while caring for patients during the COVID-19 pandemic: an integrative review of qualitative studies. J Nurs Manag. 2022;30(7):2245–58.
- Gao X, Jiang L, Hu Y, Li L, Hou L. Nurses' experiences regarding shift patterns in isolation wards during the COVID-19 pandemic in China: A qualitative study. J Clin Nurs. 2020;29(21–22):4270–80.
- Simonovich SD, Spurlark RS, Badowski D, Krawczyk S, Soco C, Ponder TN, Rhyner D, Waid R, Aquino E, Lattner C, et al. Examining effective communication in nursing practice during COVID-19: A large-scale qualitative study. Int Nurs Rev. 2021;68(4):512–23.
- Vazquez-Calatayud M, Regaira-Martinez E, Rumeu-Casares C, Paloma-Mora B, Esain A, Oroviogoicoechea C. Experiences of frontline nurse managers during the COVID-19: A qualitative study. J Nurs Manag. 2022;30(1):79–89.
- 28. Catania G, Zanini M, Hayter M, Timmins F, Dasso N, Ottonello G, Aleo G, Sasso L, Bagnasco A. Lessons from Italian front-line nurses' experiences during

the COVID-19 pandemic: A qualitative descriptive study. J Nurs Manag. 2021;29(3):404–11.

- Lyman B, Horton MK, Oman A. Organizational learning during COVID-19: A qualitative study of nurses' experiences. J Nurs Manag. 2022;30(1):4–14.
- Pavlopoulos V. Interpretative phenomenological analysis.international encyclopedia of the social &behavioral sciences. Second Edition) Elsevier LtdLia Figgou; 2015.
- 31. Smith JA. Qualitative psychology: A practical guide to research methods. London, UK: SAGE Publications Ltd;: Birkbeck University of; 2024.
- Sheard L, Marsh C, Mills T, Peacock R, Langley J, Partridge R, Gwilt I, Lawton R. Using patient experience data to develop a patient experience toolkit to improve hospital care: a mixed-methods study. In, edn. Southampton (UK); 2019.
- Pyo J, Lee W, Choi EY, Jang SG, Ock M. Qualitative research in healthcare: necessity and characteristics. J Prev Med Public Health. 2023;56(1):12–20.
- Giorgi A. The descriptive phenomenological method in psychology: A modified Husserlian approach. Duquesne University: Duquesne University Press; 2009.
- 35. Lincoln YS, Guba EG. But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. New Dir Program Evaluation 1986:73–84.
- Billings J, Ching BCF, Gkofa V, Greene T, Bloomfield M. Experiences of frontline healthcare workers and their views about support during COVID-19 and previous pandemics: a systematic review and qualitative meta-synthesis. BMC Health Serv Res. 2021;21(1):923.
- Lam SKK, Kwong EWY, Hung MSY, Pang SMC, Chien WT. A qualitative descriptive study of the contextual factors influencing the practice of emergency nurses in managing emerging infectious diseases. Int J Qual Stud Health Well-being 2019;14(1):1626179.
- Li G, Zhang Q, Fan J, Li Q, Yao W, Xin A. A qualitative study on the physical and psychological experiences of frontline nurses in the prevention and control of COVID-19. Chin Gen Pract Nurs. 2020;18(6):682–6.
- Huo R, Ouyang F, Zhu L, Zhang J. The lived experience of support nurses during the coronavirus disease 2019 outbreak: qualitative research. Chin J Nurs. 2020;49(S1):163–6.
- Li J, Wang Y, Wang Y, Shi J, Xu W, Chen H, Li X. Meta integration of qualitative study on physical and mental status of nurses fighting coronavirus disease 2019. Occup Health Emerg Rescue (in Chinese). 2021;39(2):200–6.

- Gerada C. Clare Gerada: some good must come out of covid-19. BMJ. 2020;369:m2043.
- 42. Kim DH. Structural factors of the middle East respiratory syndrome coronavirus outbreak as a public health crisis in Korea and future response strategies. J Prev Med Public Health. 2015;48(6):265–70.
- 43. Yao L, Chen E, Chen Z, Gong Z. From SARS to H7N9: the mechanism of responding to emerging communicable diseases has made great progress in China. Biosci Trends. 2013;7(6):290–3.
- 44. Haldane V, De Foo C, Abdalla SM, Jung AS, Tan M, Wu S, Chua A, Verma M, Shrestha P, Singh S, et al. Health systems resilience in managing the COVID-19 pandemic: lessons from 28 countries. Nat Med. 2021;27(6):964–80.
- 45. Fan Y, Bai X, Cheng Z, Yang Z, Li H. Qualitative study of medical personnel's experience of participating in severe infectious diseases prevention and control training. Health Vocat Educ (in Chinese). 2023;41(3):145–8.
- Chen C, Hu X, Jiang W, Mu XH, Zhang M, Lang H. Characteristic elements of nursing crisis leadership in infectious public health emergencies: a qualitative study. J Nurs Sci (in Chinese). 2023;38(16):77–81.
- Zhang D, Liao H, Jia Y, Yang W, He P, Wang D, Chen Y, Yang W, Zhang YP. Effect of virtual reality simulation training on the response capability of public health emergency reserve nurses in China: a quasi-experimental study. BMJ Open. 2021;11(9):e048611.
- Billings J, Greene T, Kember T, Grey N, El-Leithy S, Lee D, Kennerley H, Albert I, Robertson M, Brewin CR, et al. Supporting hospital staff during COVID-19: early interventions. Occup Med (Lond). 2020;70(5):327–9.
- Zhang D, Jia Y, Chen Y, Meng G, Zhuang X, Chen L, Wang D, Zhang YP. Effect of an online resourcefulness training in improving psychological wellbeing of front-line medical staff: a quasi-experimental study. BMC Psychol. 2022;10(1):217.

Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.