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Perspectives of nursing directors on emergency nurse deployment during the pandemic of COVID-19: A nationwide cross-sectional survey in mainland China

Ling-xiao He MScN, RN[1] | Hong-fei Ren MScN, RN[2] | Feng-jiao Chen MScN, RN[3] | Zhong-lan Chen PhD, RN[4] | Cong Wang MScN, RN[5] | Rui-xue Zhang MScN, RN[6] | Yan Jiang PhD, FAAN, RN[6]

[1]Trauma Center of West China Hospital, Sichuan University/West China School of Nursing, Sichuan University, Chengdu, China

[2]Department of Gastroenterology, West China Hospital, Sichuan University/West China School of Nursing, Sichuan University, Chengdu, China

[3]Department of Hematology, West China Hospital, Sichuan University/West China School of Nursing, Sichuan University, Chengdu, China

[4]Department of Cardiology, West China Hospital, Sichuan University/West China School of Nursing, Sichuan University, Chengdu, China

[5]Evidence-based Nursing Center, West China Hospital, Sichuan University/West China School of Nursing, Sichuan University, Chengdu, China

[6]Nursing Department of West China Hospital, Sichuan University/West China School of Nursing, Sichuan University, Chengdu, China

Correspondence
Yan Jiang, Nursing Department of West China Hospital, Sichuan University/West China School of Nursing, Sichuan University, Chengdu, China.
Email: hxhljy2018@163.com

Abstract

Aims: The aim of this study is to investigate the situation and perceptions of nursing directors about emergency nursing staff deployment in designated hospitals during the pandemic of COVID-19 in mainland China.

Background: The pandemic of COVID-19 has significantly depleted health care resources, leading to increased burden of nursing care and staffing and exacerbating the crisis in health care facilities. Currently, how to effectively plan and schedule nursing staffing in the pandemic still remains unknown.

Methods: From 14 July 2020 to 8 September 2020, 62 nursing directors of designated hospitals in mainland China were invited to participate in a cross-sectional online survey for their perceptions of nursing human-resource allocation during the pandemic of COVID-19.

Results: A total of 55 valid questionnaires were collected, showing that 96.36% of the hospitals had emergency nursing organizations and management systems during the pandemic, 96.36% had well-established scheduling principles for nursing human resources and 54.55% of hospitals had human-resource scheduling platforms. All the hospitals had trained emergency nursing staff in infection control (55, 100%), work process (51, 92.73%) and emergency skills (50, 90.91%). Most of the participants were satisfied with the nursing staffing deployments at their institutions (52, 94.55%). However, more than two thirds of them believed that their human-resource deployment plans need further improvements (39, 70.91%).

Conclusions: Most of the designated hospitals investigated had established emergency nursing organizations, and management systems, and related regulations for

the epidemic. However, the contents mentioned above still need to be further standardized.

Implications for nursing management: The surge of patients in the epidemic was considerable challenge for the emergency capacity of hospitals. In the future, we should pay more attention to the following aspects: building emergency nursing staffing platforms, increasing emergency human-resource reserves, establishing reliable communication channels for emergency response teams, improving the rules and regulations of emergency human-resource management, offering more training and drills for emergency-related knowledge and skills and giving more focus on bio-psycho-social wellbeing of nurses.

1 | BACKGROUND

Infectious disease is a considerable challenge for the world. In the last 30 years, new infectious diseases have arisen frequently, and COVID-19 is one of the heaviest, with a mortality rate almost comparable with the Spanish flu of 1918 (Faust et al., 2020), causing protracted damage to health systems, lifestyles, societies and economies around the world. The public health systems have faced enormous challenges after the emergence of COVID-19. The World Health Organization (WHO) suggests that it is crucial to plan the supply of quality services and redistribution of resources during the pandemic of COVID-19, focusing on prevention and responding to COVID-19 while safeguarding essential health services (WHO, 2020).

Nurses compose the highest proportion of staff in the global health care systems. They are the health care workers who have the most frequent contact with patients and contribute a critical component in responding to COVID-19. The pandemic has resulted in increasing health care burdens and relative shortages of nursing staff (Hoogendoorn et al., 2021), which may cause inefficient and unsafe health services.

During the pandemic of COVID-19, the Chinese government has set up a large number of designated hospitals across the country to concentrate on screening and treating COVID-19 patients, coordinating the management of limited medical resources and improving treatment efficiency. Notably, in 2019, registered nurses composed 43.78% of the total number of health workers in mainland China (National Health Commission of the People's Republic of China, 2019). Still, the demand for frontline nursing staff increased significantly after the emergence of the epidemic, and nurses have accounted for 68% of the medical staff dispatched to the frontline (The State Council of PRC, 2020). With increased demand and limited resources, how the designated hospitals adjust their nursing human-resource allocations to cope with the complex epidemic care tasks becomes a significant problem. From the perspective of nursing directors, this study aims to sort out the nursing staffing allocation and emergency nursing staffing management in designated hospitals during the peak of the epidemic in mainland China.

2 | METHODS

2.1 | Study design

This study conducted a cross-sectional online survey with the Questionnaire Star online survey platform (www.wjx.cn).

This study was part of a research project on nursing staff deployment, which conducted in-depth mixed-method surveys of nursing directors, nurse managers and frontline nurses in designated hospitals across China to investigate human-resource allocation during the epidemic and further develop relevant nurse deployment criteria. The study aimed to investigate the current status of emergency nursing human-resource allocation in designated hospitals in mainland China after the outbreak of COVID-19 and the perceptions of nursing directors who are in charge of nursing human-resource management.

2.2 | Study population and sample

The inclusion criteria for the study were directors of nursing departments of public hospitals designated by the government to receive patients infected by COVID-19, who had more than 1 year of working experience in their current positions and were mainly in charge of emergency nursing staff deployment during the epidemic. Random samples of 84 designated hospitals in 31 provinces, municipalities and autonomous regions in mainland China were selected considering the representativeness of the data. The survey was conducted from 14 July 2020 to 8 September 2020. We first obtained the informed consent of the respondent after telephone and message contacts and then sent the web link of the questionnaire to the respondents through an instant messenger. Finally, a total of 62 questionnaires

were distributed. We reminded the respondents 1 week later after sending the questionnaire to ensure a sufficiently high response rate.

2.3 | Variables and measurements

The researchers designed a semi-structured questionnaire for this study. It consisted of 26 entries, concerning hospital characteristics (5 entries), nursing director characteristics (7 entries) and emergency human-resource deployment (14 entries). More specifically, the survey on emergency human-resource deployment survey includes 12 closed and 2 open-ended questions. The open-ended questions are 'What are the principles of emergency dispatch of nursing manpower in your hospital?' and 'Do you have any suggestions for nursing staffing deployment in COVID-19?' Respondents were invited to

give brief responses to these two questions. The survey draft was reviewed by five experts from areas such as nursing management, nursing research, evidence-based nursing, human-resource management and frontline nursing management. The draft was also revised based on the feedback from two nursing directors after a pre-survey.

2.4 | Ethical considerations

This study followed the Declaration of Helsinki and was approved by the Ethics Committee of West China Hospital, Sichuan University (Ethics Approval No. 2020-198).

2.5 | Data analysis

The survey data were exported from the online survey platform and saved with Microsoft Excel 365. Missing values in the data had been carefully checked. Categorical variables were expressed as frequencies and percentages, and continuous variables were expressed as means and standard deviations. Answers to open-ended questions

TABLE 1 Distribution of designated hospitals in mainland China

Province/municipality/autonomous region	n	%
Beijing	1	1.82
Chongqing	2	3.64
Fujian	2	3.64
Gansu	1	1.82
Guangdong	1	1.82
Guangxi	2	3.64
Guizhou	2	3.64
Hainan	2	3.64
Hebei	1	1.82
Henan	2	3.64
Heilongjiang	3	5.45
Hubei	3	5.45
Hunan	1	1.82
Jilin	2	3.64
Jiangsu	4	7.27
Jiangxi	2	3.64
Liaoning	2	3.64
The Inner Mongolia Autonomous Region	2	3.64
Ningxia	2	3.64
Shandong	2	3.64
Shanxi	2	3.64
Shaanxi	1	1.82
Shanghai	2	3.64
Sichuan	3	5.45
Tianjin	2	3.64
The Tibet Autonomous Region	2	3.64
The Xinjiang Uygur Autonomous Region	2	3.64
Yunnan	1	1.82
Zhejiang	1	1.82
Total	55	100

TABLE 2 Basic characteristics of designated hospitals

Hospital characteristics	n	%
Institutional level of hospital		
Level IIA	2	3.64
Level IIIB	5	9.09
Level IIIA	48	87.27
Type of hospital		
Specialist hospital	17	30.91
General hospital	38	69.09
COVID-19 designated facility level of hospital		
Provincial hospital	42	76.36
Municipal hospital	10	18.18
County (district) hospital	3	5.45
Number of nursing staff		
<100	1	1.82
100–300	7	12.73
300–500	10	18.18
500–1,000	8	14.55
1,000–2,000	10	18.18
2,000–4,000	16	29.09
≥4000	3	5.45
Number of beds		
<300	3	5.45
300–500	4	7.27
500–1,000	15	27.27
1,000–2,000	5	9.09
2,000–4,000	20	36.36
≥4000	8	14.55

were analysed using thematic analysis methods, which follow the six steps Braun and Clarke (2006) proposed, to identify the themes related to emergency nursing staff deployment during the pandemic of COVID-19.

3 | RESULTS

3.1 | Basic characteristics of designated hospitals

A total of 61 questionnaires were collected within the survey time limit, of which one was incorrectly filled out and five were repeatedly filled out. Hence, the final number of complete responses was 55, from 29 provinces, municipalities and autonomous regions in mainland China. So each region responded to one to four questionnaires. Table 1 shows the regional distribution of hospitals, in which the institutional levels of hospitals were mainly tertiary (48, 87.27%), the types were mainly general (38, 69.9%) and the facility levels were mainly provincial (42,76.36%), as listed in Table 2.

TABLE 3 Demographics of nursing directors

Demographics	n	%
Sex		
Male	1	1.82
Female	54	98.18
Age (years)		
30–40	3	5.45
40–50	23	41.82
50–60	28	50.91
≥60	1	1.82
Ethnicity		
Han	52	94.55
Other	3	5.45
Academic qualifications		
Associate's degree	1	1.82
Bachelor's degree	40	72.73
Master's degree and above	14	25.45
Job title		
Supervisor nurse	4	7.27
Associate professor of nursing	15	27.27
Professor of nursing	36	65.45
Number of years of work		
10–20	4	7.27
20–30	21	38.18
30–40	30	54.55
Number of years in current position		
1–5	16	29.09
5–10	22	40.00
10–20	16	29.09
>20	1	1.82

3.2 | Demographic characteristics of nursing directors

As shown in Table 3, among the 55 nursing directors surveyed, 54 were female (98.18%). Their ages were mainly between 40 and 60 years old (92.73%); ethnicity was mainly Han Chinese (52, 94.55%); education levels were mainly bachelor's degree or above (54, 98.18%); titles were mainly senior (51, 92.73%); working years were mainly between 20 and 40 (51, 92.73%); and years being director of nursing department were mainly less than 20 years (54, 98.18%).

3.3 | Allocation of nursing emergency staffing during the epidemic

The detailed responses to the quantitative questions in the questionnaire are listed in Table 4.

3.3.1 | Hospital area setting during the epidemic

During the epidemic, various ward setting strategies were adopted by the designated hospitals, with all 100% hospitals having fever clinics, 78.18% having wards for confirmed cases, 67.27% having isolation wards for confirmed critical cases, 83.64% having wards for suspected cases and several (12, 21.82%) having areas such as holding rooms and buffer wards for the admission and observation of the outcomes of close contacts.

3.3.2 | Nursing manpower reserve, training and scheduling during the epidemic

A total of 96.36% of the hospitals had emergency nursing organizations and management systems during the epidemic. The care models were mainly accountable holistic care (40, 72.73%). Besides, all hospitals had mature access criteria for public health nursing human-resource pools, 96.36% had sound human-resource scheduling principles and 54.55% had regional or institutional unified scheduling platforms.

All the hospitals trained emergency nursing staff in infection prevention and control. In addition, some of the hospitals also provided training in work processes (51, 92.73%) and emergency skills (50, 90.91%). The forms were mainly decentralized on-site training (20, 36.36%) and online training (16, 29.09%). Most hospitals also evaluated the outcomes of training from both theoretical and practical aspects (45, 81.82%). During the epidemic, supports for frontline nursing staff from the hospitals mainly consisted of personal protective equipment (53, 96.36%), life's necessities (52, 94.55%) and psychological support (50, 90.91%).

Overall, most nursing directors were satisfied with the nursing human-resource allocation in their institutions during the epidemic

TABLE 4 Nursing manpower deployment during the epidemic

Questionnaire entries	*n*	%
What are the priority areas set up in your health care facility in response to the outbreak?		
Fever clinic	55	100.00
Isolation ward (for confirmed cases)	43	78.18
Isolation ward (for confirmed critical cases)	37	67.27
Isolation ward (for suspected cases)	46	83.64
Other	12	21.82
Does your health care facility have an organizational management system for nursing emergencies?		
Yes	53	96.36
No	2	3.64
What is the type of care delivery model in your health facility during the critical period of the epidemic?		
Case-based care	2	3.64
Function-based care	8	14.55
Holistic care	40	72.73
Other	5	9.09
What are the key elements in developing the entry criteria for the nursing manpower pool in your health care facility?		
≥5 years of experience in the relevant profession	35	63.64
Licenced practical nurse and above	34	61.82
Age <50 years	39	70.91
Physical and mental healthy	52	94.55
Professional composition: respiratory, infectious, critical care medicine, psychological, infection control nurse	40	72.73
Other	14	25.45
Does your health care facility have a well-established principle of emergency deployment of nursing manpower in response to an epidemic?		
Yes	54	98.18
No	1	1.82
In response to the epidemic, what is the emergency care manpower deployment platform that your health care facility relies on?		
Yes	30	54.55
No	23	41.82
Unclear	2	3.64
What is the content of the pre-service training for nursing staff developed by your health care facility in response to the epidemic?		
Work process training	51	92.73
Infection prevention and control training	55	100.00
Emergency skills training	50	90.91
Other	14	25.45
In response to the epidemic, the training of nursing staff in your health care facility has mainly taken the form of		
Intensive on-site training	7	12.73
Decentralized on-site training	20	36.36
Web-based training	16	29.09
Other	12	21.82
In response to the epidemic, your health care facility's assessment of nursing staff training takes the form of		
Theoretical assessment	5	9.09
Skills assessment	4	7.27
Assessment combining theory and skills	45	81.82
Other	1	1.82
What supportive measures did your hospital provide for frontline nurses during the epidemic?		
Psychological support	50	90.91

(Continues)

TABLE 4 (Continued)

Questionnaire entries	*n*	%
Personal protective equipment	53	96.36
Life's necessities	52	94.55
Other	18	32.73
Were you satisfied with the nursing staffing of your hospital during the epidemic?		
Very satisfied	19	34.55
Satisfied	33	60.00
Normal	2	3.64
Not satisfied	1	1.82
What indicators do you think can be used to evaluate the rationality of nursing manpower deployment?		
Quality of care	47	85.45
Nursing workload	49	89.09
Adverse nursing events	33	60.00
Nursing staff satisfaction	49	89.09
Other	10	18.18

prevention and control period (52, 94.55%). The rationality of the allocation was mainly evaluated in terms of quality of care (47, 85.45%), nursing workload (49, 89.09%), nursing staff satisfaction (49, 89.09%) and nursing adverse events (33, 60.00%).

3.3.3 | Other suggestions for staff scheduling and human-resource deployment

The content of the thematic analysis in this paper mainly includes nursing staff scheduling principles and other suggestions given by the nursing directors for human-resource allocation, which are aggregated in the following four themes:

Establish nursing emergency systems and emergency personnel dispatching platforms
Most of the respondents recognized the importance of the nursing emergency system and believed that a nursing emergency system should have a clear top-down structure, such as 'the hospital-nursing department-wards three-level structure' (ND27). In addition, it is necessary to set up an online human-resource platform to achieve accurate emergency human-resource management and facilitate real-time information communication. Most hospitals still lacked adequate preparations for the epidemic, and it is necessary to make arrangements for the nursing staffing pool in peacetime. For example, wards included emergency response nurses should arrange more human resources to avoid the shortage of nurses caused by sudden transfers in the epidemic. Furthermore, 'It is necessary to strengthen the drills of the emergency nursing team in peacetime, and make emergency plans for emergencies' (ND39).

Emergency manpower planning
The respondents generally believed that COVID-19 had accentuated the harm caused by the lack of nurses, so the hospital nursing

manpower should be increased in peacetime to prepare for emergencies and urgent situations. At the same time, in addition to nursing personnel, auxiliary nursing staffing (for medical supplies, sanitation etc.) should also be increased. 'In addition to the treatment nurses, the auxiliary nursing staffs are also insufficient, resulting in the nurses in isolation wards taking care of too many things, and under great pressure' (ND19). The nursing staff's professional orientation, working ability, physical quality and mental health status should be comprehensively considered when selecting an adequate candidate for the emergency nursing manpower pool. Respondents also suggested getting more nurses specialized in infectious diseases, respiratory diseases and critical care as frontline staff reserved for the epidemic, followed by other specialties such as internal medicine, perioperative care and psychology. A multi-specialty team of nurses is more conducive to responding to emergencies. 'We need to reserve multidisciplinary nurses such as critical care, CRRT, traditional medicine, and psychology' (ND21). At the level of knowledge and skills, nurses need to be proficient with the title of supervising nurse or above and working experience for no less than 3 years. In terms of physical and mental preparation, nurses are required to be in good physical and psychological status, with a strong will to participate in epidemic preparations. 'It is recommended to transfer nurses after evaluating their psychological states' (ND35); 'Consider the physical fitness and working ability of nurses' (ND1). In addition, training on nursing skills for acute and critical illnesses should also be considered to ensure each person can be quickly activated when the epidemic breaks out, without spending too much time on temporary training. 'To better ensure the emergency human-resource deployment during the epidemic and making a rapid response, it is necessary to organize a group of reserve personnel with a reasonable structure and conduct regular training' (ND52).

Principles of nursing manpower scheduling
In terms of manpower scheduling principles, the respondents believed that the severity of the crisis should be assessed in advance, and

nursing teams should be established in batches to support the transfer of personnel within and outside the hospitals. To meet the needs of key departments and seriously ill patients in the pandemic, 'Nursing manpower was preferentially dispatched to Hubei (Wuhan); guaranteeing sufficient manpower for fever clinic nurses, isolation ward nurses, and outpatient emergency departments, and achieving appropriate allocation for the nursing manpower in isolation observation rooms' (ND38). At the same time, it is necessary to make dynamic adjustments at any time according to the clinical needs of patients and the ability levels of nurses, 'According to the development of the epidemic, make overall arrangements for follow-up nursing manpower, and prepare for expanding ward admissions and replacing front-line personnel' (ND12). The above principles should be regulated in the form of systems and procedures. At the same time, it is better to integrate each emergency nursing member into a task-oriented, multi-disciplinary functional team, which helps maximize team's efficiency, 'It is recommended to enter the isolation ward in the form of an integrated team' (ND39).

Organizational support

The respondents also mentioned the physical and mental support for nurses, including considering the family burden of the nurse chosen to the frontline, whether there are elderly or children who need to be taken care of and so forth, stressing the importance of maintaining the mental health of nursing staff. 'Double-earner families cannot both be on the front-line fighting against the epidemic' (ND51). 'Nurses whose spouses work at different places, or who have difficulty taking care of their families, should not be considered candidates for emergency supports' (ND39). In addition, the respondents suggested from the institutional level that incentive procedures should also be adopted to encourage nurses to participate in emergency support, including providing them incentives in terms of salary bonuses, promoting their professional title and meriting their evaluations to increase their willingness to participate in the fight against the epidemic.

4 | DISCUSSION

The nursing directors surveyed had reviewed the nursing manpower allocation in hospitals during the peak of the epidemic of COVID-19 (from February 2020 to March 2020) in mainland China and illustrated their viewpoints. To the best of our knowledge, there are no quantitative or qualitative studies on the details of hospital-level nursing manpower allocation during this period. From the perspective of managers, manpower shortages were the most significant problem during the peak of the pandemic. COVID-19 made the manpower demand for patient care exceed the available numbers, which was confirmed by both objective and open-ended questions in the questionnaire. How to rationalize the allocation of limited nursing human resources deserves in-depth discussions on aspects such as planning frontline priority areas, improving the care model of nursing services, screening nursing staff and creating more nursing manpower reserves,

better training in anti-epidemic knowledge and skills, rationalizing the nursing schedules and improving the ability of nursing staff to cope with the epidemic through active organizational supports.

4.1 | Hospital planning and regional setting

Approaches such as concentrating patients in designated hospitals, planning and renovating key areas in hospital and providing high-density medical care can help efficiently regulate and allocate relevant resources (Wang et al., 2020). Different hospitals have various planning for key areas. Most first-line hospitals have fever clinics and isolation wards to screen and treat confirmed cases, but some hospitals only have centralized observation areas for the screening and treating. In fact, at the peak of the epidemic, in addition to the initial hospital system overload phase when mildly ill patients and close contacts were encouraged to be isolated at home, hospitals preferred to place mildly ill patients and close contacts under intensive medical observation to prevent further risk of community transmission. But this practice also increased the demand for nurses. There is still a lack of research on whether different regions need to further adjust their human-resource allocation according to the patient intake.

4.2 | Wards' manpower supplementation and working patterns

Increasing human resources can effectively reduce mortality during a pandemic (Xie et al., 2021). And redeploying non-first-line nurses in the fight against COVID-19 can help health care organizations avoid possible human-resource crises. For example, in the ideal situation, ICUs should have a nurse–patient ratio of 1:1, but this ratio is difficult to achieve during a pandemic. Singapore has relaxed the nurse–patient ratio to 1:1.3 for ICUs, promoted collaborative patient care with critical and non-critical care nurses and provided advanced training for non-intensive care nurses to ensure the quality of care. At the same time, they advocated the deployment of nursing staff from other specialties to general wards, HDUs or non-direct care positions in ICUs to fill the staff shortages caused by the transfer (Lee et al., 2020). This procedure is also the most common practice in many other hospitals during the epidemic (Hemingway & Silvestri, 2021; Hickey et al., 2020; Lee et al., 2020; Wells et al., 2021). By closing outpatient clinics and cancelling elective surgeries, the overall human resources are tilted towards the front line of the epidemic with high nursing needs.

Our survey found that most hospitals adopted accountable holistic approaches to patient care during the epidemic. Still, others adopted functional or other forms of care, which may be mainly due to relative shortages of nursing manpower. In fact, during the peak of the epidemic, there were shortages of frontline nurses and logistical support staff. So nurses took on heavier workloads, including daily caring routines for patients, protective materials handling and environmental cleansing, as confirmed by another study of

medical aid teams in Wuhan (Wei et al., 2020). Research has shown that redeploying health care workers into task-based groups with clear leadership can increase efficiency and reduce risk by maximizing their existing skills (Vera San Juan et al., 2022). Therefore, task-oriented functional nursing may help ensure patient care quality of patient care at the peak of the epidemic during manpower shortage. The responses obtained from respondents also reflected this viewpoint. It is worth further exploring whether the shortages of nursing human resources can be overcome through changing the nursing care model, adjusting shift length and optimizing personnel division of labour.

4.3 | Establishment of emergency human-resource pool and training of personnel

Establishing an emergency pool of nursing manpower resources is essential for human-resource dispatch during an epidemic. The accreditation standards for general tertiary hospitals in mainland China (National Health Commission of the People's Republic of China, 2011) stipulate that hospitals need to set up nursing human-resource pools. Almost all of the frontline hospitals in this survey have corresponding access criteria and principles for manpower dispatch. Still, there are inconsistencies in content, especially regarding age, professional title and years of service requirements for nurses. Nearly half (41.82%) of the hospitals do not have dedicated nursing manpower emergency dispatches. The content mentioned above still need to be further standardized. Considering that the management problems encountered in the epidemic are often changing and require site-specific responses, it is believed that the access criteria for the emergency manpower pool can be developed separately according to the situation of the hospital, while a unified manpower dispatching platform and good communication channels for personnel also need to be established (Hofmeyer & Taylor, 2021).

Health care organizations have conducted pre-service knowledge training for nursing staff deployed to the frontline, including working processes, infection prevention and control, and emergency skills. But the contents of these training and assessments are inconsistent. Considering the possible risks associated with aggregation during an outbreak, most hospitals opt for decentralized on-site or web-based training.

Some studies have shown that group distributed education can enhance learning outcomes (Marks et al., 2021), and others have found that simulation-based training can significantly reduce nurses' anxiety (Sullivan et al., 2021). However, complex practice arrangements during pandemic can be labour-intensive and time-consuming. It is not yet possible to confirm which specific training modality will better facilitate the acquisition of relevant knowledge and skills by nursing staff. In addition, training in acute and critical care skills is necessary due to the surge of critically ill patients in the COVID-19 outbreak (Wells et al., 2021).

4.4 | Physical and psychological support and logistical support for caregivers

Nursing staff often faces stress-related symptoms during an epidemic. Studies have shown that nurses are at greater risk of depression and anxiety than doctors (Lai et al., 2020). Heavy workloads, lack of sufficient equipment and supplies and fear of the pandemic can influence the emergence and development of psychological problems (de Kock et al., 2021). Thus, supportive safeguards for nurses can help overcome their psychological issues. The vast majority of nursing directors surveyed believed that the hospitals had provided various guarantees to frontline nursing staff during the epidemic, including personal protective equipment, life's necessities and psychological support. These approaches may help keep nurses in good physical and mental state, but whether they are sufficient and what degree of support can help frontline nurses still needs further research.

4.5 | Evaluation from nursing directors

Overall, most nursing directors were either very satisfied (34.55%) or satisfied (60.00%) with human-resource allocation during the epidemic prevention and control period. The results indicated no shortage of manpower from the hospital perspective, as the demand for routine outpatient and health care reduced during the epidemic, except for the frontline departments (Halcomb et al., 2020). The problem mainly lies reasonably dispatching nurses to the frontline of the epidemic, building manpower reserve pools, determining dispatching principles and ensuring the quality of pre-training. Managers tend to evaluate the effectiveness of nursing manpower allocation using quality of care, per capita nursing workload and nursing staff satisfaction. This also indicates that when respondents evaluated human-resource allocation during the epidemic in terms of the above aspects, they found the overall effect still satisfying.

4.6 | Limitations

This study still has some shortcomings. First, the survey results cannot cover all provinces entirely and may not reflect the actual situation of designated hospitals in some areas of mainland China. Second, the study adopts an online survey format. The questions focus on describing the current status of human-resource deployment, failing to explore in-depth the difficulties encountered by managers in the process of human-resource deployment and how to solve them. In the future, further qualitative research can be conducted to explore the principles of emergency human-resource deployment. Besides, qualitative research can also be conducted to explore the principles and solutions of emergency human-resource deployment.

5 | CONCLUSION

This study conducted preliminary research on the allocation of nursing manpower resources in designated hospitals during the peak of first round of the COVID-19 epidemic. The designated hospitals surveyed generally have different emergency nursing organizational management systems, access criteria for emergency manpower reserve, dispatching principles and pre-service training based on the hospital situation. However, the above elements still need to be further standardized.

6 | IMPLICATIONS FOR NURSING MANAGEMENT

This study found that during the peak of the first round of the COVID-19 epidemic in mainland China, most hospitals encountered shortages of nursing manpower. But through the construction of effective emergency systems and manpower reserve and scheduling platforms, the buffer capacities of the hospitals were enhanced to face the human-resource dilemma. The epidemic has highlighted the importance of nursing human-resource management, and the current medical system is not yet fully prepared. In today's global pandemic, management has gradually become standardized. We need to re-examine the nursing emergency organizations and management systems, especially concentrating on aspects such as constructing emergency nursing manpower platforms, establishing reliable communication channels for emergency response teams, increasing the reserve of emergency human resources (especially in majors such as respiratory, infectious, critical illness etc.), improving the rules and regulations of emergency human-resources management, increasing emergency-related knowledge and skills, performing more training and plan drills and paying more attention to the physical, mental and social status of nursing staff. In the future, through research on the above topics, we will try to develop better deployment plans to rationally utilize nursing manpower and improve patient experience and nursing outcomes.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICS STATEMENT

This study was approved by the Ethics Committee of West China Hospital, Sichuan University (No. 2020-198).

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on reasonable request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ORCID

Ling-xiao He https://orcid.org/0000-0002-7121-444X
Rui-xue Zhang https://orcid.org/0000-0002-1031-0139

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