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Survey of role stress among specialty nurses working in tertiary general hospitals across China: a cross-sectional descriptive study

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Abstract

Background Occupational stress can affect specialty nurses' quality of work, especially for those working in care units. This study, therefore, investigated role stress and its related factors among specialty nurses working in tertiary general hospitals.

Methods This cross-sectional descriptive study used convenience sampling to recruit 795 Chinese specialty nurses in 11 tertiary general hospitals (from February to March 2023). A questionnaire survey was conducted using the Basic Information Questionnaire and the Role Stress Scale. Multiple linear regression analyses were performed on the survey data to explore the factors affecting role stress.

Results The total role stress score of specialty nurses in tertiary general hospitals was 52.05 ± 19.98 . The highest mean item score was quantitative overload, followed by qualitative overload, role conflict, and role ambiguity, which had the lowest score. Multiple linear regression analysis revealed that gender ($\beta = -0.085$, $p < 0.05$), educational background ($\beta = 0.077$, $p < 0.05$), and work experience ($\beta = -0.104$, $p < 0.05$) were the main factors influencing role stress among specialty nurses.

Conclusions Specialty nurses in tertiary general hospitals had higher levels of role stress than general nurses. Their role stress was primarily reflected in role overload, followed by role conflict and ambiguity. The factors affecting specialty nurses' role stress included gender, work experience, and educational background. Nursing managers should monitor the role stress experienced by specialty nurses in tertiary general hospitals. Providing psychological support for male specialty nurses, performance rewards and learning opportunities for highly educated specialty nurses, and continuous training for inexperienced specialty nurses are essential measures to relieve role stress.

Keywords General hospitals, Nurses, Role stress, Specialties

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Background

Role stress can be defined as a set of expectations, responsibilities, and obligations applied to employees from those who can influence employees and help to define their role [1]. Kahn et al. introduced the concept of *role stress* for the first time in 1964 [2]. It is an appraisal of the disparity between what is expected of someone and what they practice in their role [3]. Thus, role stress occurs when there is a divergence between what is perceived to be the role expectation and what is accomplished within the role [4]. Role stress has three dimensions: *ambiguity*, *conflict*, and *overload*. *Role ambiguity* refers to the uncertainty regarding the action required for a job role. It occurs when individuals have incomplete, vague, or unclear information to meet the job requirements sufficiently [5]. *Role conflict* occurs when a person faces incompatible demands between the expectations of two or more parties or a contradiction between the job's external demands and the internal standards of behavior in the same role. Finally, *role overload* results from an individual being expected to complete varied tasks in insufficient time [6]. Role stress is a widespread global phenomenon in healthcare that significantly affects health professionals' psychological well-being [7]. It manifests in symptoms such as professional burnout, emotional distress, anxiety, and depression [8]. Accordingly, role stress has become the focus of hospital administrators [9].

The World Health Organization estimates that nursing is the largest occupational group in the health sector, accounting for about 59% of health professionals [10]. Since they are directly involved in patient care, nurses face more role stress than other healthcare professionals [11]. Specialty nurses are registered nurses who have received prescribed education and training in a specific nursing field, possess the corresponding specialized skills, and have passed the assessments needed to obtain professional qualification certificates [12]. In China, compared with general nurses, specialty nurses possess a solid foundation comprising nursing theory, professional skills, and rich experience in specific fields. They occupy a pivotal position in clinical practice and serving as the core force in outpatient clinics, consultations, and discussions of difficult cases [13]. Studies have shown that specialty nurses play an important role in improving patient compliance with care and treatment, as well as enhancing patient health outcomes [14]. Tertiary general hospitals bear the heavy responsibility of treating a large number of patients with complex or critical illnesses, and nursing work in those hospitals involves multiple professional fields [15, 16]. Therefore, tertiary general hospitals require a large number of high-quality specialty nurses to meet the needs of clinical specialized nursing services.

However, the inadequate allocation of specialized nursing positions in most tertiary general hospitals in China has resulted in the majority of specialty nurses working in a part-time capacity [17]. In this case, specialty nurses must perform not only routine clinical nursing work but also a great deal of specialized nursing work, teaching, research, and other tasks [18], which may lead to a high level of role stress among them. This state not only damages the physical and mental health of specialty nurses, leading to job burnout, low work efficiency, organizational commitment and other problems, affecting the quality of specialized nursing services and patient satisfaction, but also may cause a high turnover rate of specialty nurses, resulting in waste of resources and increased human resource costs [18–21]. Therefore, it is essential to understand the current status of role stress among specialty nurses, clarify the related factors, and develop intervention strategies to address the role stress of specialty nurses.

Relevant studies have shown that more than 50% of nurses worldwide face high stress at work [11]. Heavy professional responsibilities, large workloads, frequent shift work, and regular exposure to death or near-death patients have been proven to be factors contributing to nurses' stress [22]. However, there is less global research attention paid to the role stress of specialty nurses, especially in China. Given the late start of specialty nurse training in China, previous research on specialty nurses mainly focused on training, assessment, job responsibilities, usage, and management, and other aspects [23]. A few qualitative studies have reported the role perceptions and experiences of specialty nurses [24–26], and some quantitative studies have reported the sources of stress for specialty nurses in specific domains, such as anesthesiology [27], and intensive care [28]. Such work cannot adequately represent the specialty nursing population and thus has limited reference value for nursing managers in tertiary general hospitals [29, 30]. In addition, existing studies have shown that specialty nurses have a negative impact on job satisfaction, occupational burnout, and mental health, among other elements [31, 32], but there remains a lack of relevant data on the factors affecting role stress among specialty nurses. Therefore, we aimed to explore the influencing factors of role stress among specialty nurses in tertiary general hospitals to reduce adverse impacts and improve nursing service quality.

Methods

Study design and ethical considerations

The study used a descriptive, cross-sectional design to explore the current situation and influencing factors of role stress among specialty nurses working in tertiary

general hospitals in China. The study was approved by the Ethics Committee of Zhengzhou University (ZZUIRB2023192).

Sample

According to the minimum sample size calculation method [33], the minimum sample size should be 10 to 20 times the number of estimated parameters, the final sample size for this study ranged from 253 to 529, considering a potential 10%–15% of invalid questionnaires. Actually, a large sample size was enrolled to minimize selection bias and increase the generalizability of our findings. A total of 807 questionnaires were received; however, 12 questionnaires with obvious errors (e.g., all answers are the same) were eliminated. Therefore, 795 subjects were included.

The inclusion criteria were: (1) being a registered nurse; (2) having a specialty nursing training certificate issued by the nursing association or nursing quality control center; (3) having over one year of work experience in tertiary general hospitals; and (4) agreeing to voluntarily participate in the survey. Additionally, we excluded those who took sick or maternity leave or were absent for more than six months.

Instruments

Socio-demographic information

This study used a self-designed questionnaire to collect the socio-demographic information of participants, including gender, age, department, educational background, professional title, work experience, mode of appointment, monthly income, whether to participate in specialty nurse outpatient service, and nature of specialty nurse position.

Role stress scale

The survey was revised based on the Role Stress Scale [34] and Role Load Scale [35]. We utilized the 23-item scale updated by Li [9], measuring three dimensions: role ambiguity (six items), role conflict (seven items), and role overload (containing quantitative and qualitative overload, with five items each). The items were rated on a five-point Likert scale from one (*very inconsistent*) to five (*very fit*), with a high score indicating significant role stress (range: 23–115). The scale had a Cronbach's α coefficient of 0.961. The content validity index for the overall scale (S-CVI) is 0.930. The mean item score of the scale was calculated by dividing the total score of a dimension by the number of items within that dimension. This scale has been widely used among Chinese nurses and has shown good validity and reliability [36–38]. In this study, Cronbach's α coefficient of each domain ranged from 0.895–0.911, and that of the total scale was 0.958.

Data collection

In China, specialty nursing training is mainly provided by nursing associations or quality control centers. Henan Province is a populous province located in the central region of China. We obtained consent from the director of the Henan Nursing Quality Control Center and sent her the QR code to access the survey. Then, from February to March 2023, she established contact with the nursing managers of 11 tertiary general hospitals in Zhengzhou, the capital city of Henan Province, and informed them of the objectives and methods of the study. After consent was obtained from the nursing managers, the QR code for the questionnaire was sent to them. They distributed the QR code to qualified specialty nurses through a WeChat group for specialty nurse management. The questionnaire could be completed online using smart devices (e.g., smartphones). Respondents had the option to remain anonymous while completing the survey. Standardized instructions were provided on the first page of the questionnaire to explain the purpose and method of the survey, which helped ensure that the recovered questionnaires were comprehensive and valid. All items in the questionnaire were compulsory, and each internet protocol address was prohibited to complete the survey only once to prevent duplicate responses. Two investigators reviewed all completed questionnaires. Finally, we classified and analyzed the collected data.

Data analysis

We used the SPSS Version 21.0 statistical software for conducting the data analysis. Normality and Kolmogorov–Smirnov test indicated that role stress satisfied a normal distribution ($p > 0.05$). Furthermore, we conducted an analysis using both tolerance and the variance inflation factor (VIF) to evaluate collinearity among the variables. The results indicated that the tolerance level surpassed 0.2, while the VIF remained below 10, indicating that there was no serious collinearity issue. The normally distributed continuous data were described using mean and standard deviation, and categorical data were presented using frequencies and percentages. The differences in the total score of role stress between subgroups were assessed using independent samples t-test or one-way analysis of variance if the data met the assumption of homogeneity of variance. Multiple linear regression and stepwise variable selection analysis were performed to investigate the effects of factors such as gender, age, department, educational background, professional title, work experience, mode of appointment, monthly income, whether to participate in specialty nurse outpatient service, and nature of specialty nurse position on the role

stress of specialty nurses. $P < 0.05$ was considered significant statistically (two-tailed test).

Results

Sample characteristics

The valid questionnaires revealed that the sample comprised 749 female (94.2%) and 46 male (5.8%) specialty nurses, with an average age of 33.61 ± 4.84 years. Table 1 presents the other demographic details of the sample.

Scores of each dimension in the role stress scale

The total score of role stress was 52.05 ± 19.98 . The mean item scores of role ambiguity and conflict, quantitative and qualitative overload were 1.87 ± 0.94 , 2.11 ± 0.96 , 2.93 ± 1.09 , and 2.36 ± 1.01 , respectively. Table 2 presents the scores for each item.

Factors influencing role ambiguity

The single-factor ANOVA results indicated that age, professional title, and work experience exhibited significant differences in the role ambiguity dimension among specialty nurses (Table 3). Therefore, these factors were included in the multiple linear regression analysis, which showed that only work experience influenced role ambiguity ($p < 0.01$, Table 4).

Factors influencing role conflict

Gender, educational background, professional title, and work experience showed significant differences in the role conflict dimension among specialty nurses (Table 3). Therefore, we included these factors in the multiple linear regression analysis, which showed that only gender influenced role conflict ($p < 0.01$, Table 4).

Factors influencing role overload

Statistical differences in the quantitative overload experienced by the specialty nurses were observed related to educational background ($p < 0.05$, Table 3). In addition, statistical differences were found in the qualitative overload among specialty nurses with different educational backgrounds and work experiences ($p < 0.05$). The multiple linear regression analysis indicated that educational background influenced quantitative overload ($p < 0.05$). Similarly, educational background and work experience influenced the qualitative overload experienced by the nurses ($p < 0.05$, Table 4).

Factors Influencing the total score of role stress

The results of single-factor ANOVA showed that the difference in the role stress scores of specialty nurses who participated in specialty nursing outpatient services was not statistically significant ($p > 0.05$). There was also no statistically significant difference in role

Table 1 Sample Characteristics ($n = 795$)

Variable	<i>n</i>	%
Gender		
Female	749	94.2
Male	46	5.8
Age (years)		
≤ 30	202	25.4
31 < to ≤ 40	542	68.2
40 <	51	6.4
Department		
Medical	374	47.0
Surgical	199	25.0
Gynecological	50	6.3
Pediatrics	14	1.8
Intensive Care Unit	66	8.3
Operating room	61	7.7
Emergency	18	2.3
Others**	13	1.6
Educational Background		
Diploma	50	6.3
Bachelor's degree	698	87.8
Master's degree	47	5.9
Professional Title		
Primary nurse	16	2.0
Nurse practitioner	203	25.5
Supervisor nurse	538	67.7
Co-chief nurse	38	4.8
Work Experience (years)		
1 < to ≤ 5	115	14.5
6 < to ≤ 10	229	28.8
11 < to ≤ 15	313	39.4
16 < to ≤ 20	82	10.3
21 < to ≤ 25	36	4.5
25 <	20	2.5
Mode of Appointment		
Contract system	127	16.0
Human agency	576	72.4
Official staffing	92	11.6
Monthly Income (yuan)		
≤ 5000	108	13.6
5000 < to ≤ 10,000	381	47.9
10,000 < to ≤ 15,000	275	34.6
15,000 <	31	3.9
Whether to Participate in Specialty Nursing Outpatient Service		
Yes	65	8.2
No	730	91.8
Nature of Specialty Nurse Position		
Full-time job	35	4.4
Part-time job	760	95.6

Others**: Imaging Department, Disinfection and Supply Center, Clinical Laboratory

Table 2 Descriptive statistical measurements of the role stress scale

Items	Range	Mean Item Score
Role Ambiguity		1.87 ± 0.94
I'm not sure how much power I have in my position	1–5	2.02 ± 1.21
I'm not sure what the patient's expectations are for me	1–5	1.88 ± 1.06
I'm not very clear about my job responsibilities	1–5	1.82 ± 1.24
I can't manage my time properly at work	1–5	1.82 ± 1.12
My superiors didn't give me clear instructions about my work	1–5	1.81 ± 1.09
My work has no clear goals or plans	1–5	1.79 ± 1.11
Role Conflict		2.11 ± 0.96
In different situations, I have to deal with the same kind of things in different ways	1–5	2.55 ± 1.36
I often lack of enough hands to complete the task	1–5	2.30 ± 1.29
I'm often asked to do things that aren't really necessary	1–5	2.14 ± 1.21
I do not have enough resources, such as medical resources, computer and other hardware equipment, personnel, office space and other aspects to meet the work needs	1–5	2.08 ± 1.25
There are conflicting hospital policies or guidelines	1–5	2.07 ± 1.17
I often get conflicting demands from two or more bosses	1–5	1.74 ± 1.08
Sometimes I need to go against certain hospital policies or rules to get a job done	1–5	1.60 ± 0.99
Quantitative Overload		2.93 ± 1.09
Sometimes, I have to continue my work after hours	1–5	3.34 ± 1.36
Sometimes I have multiple responsibilities at once	1–5	3.13 ± 1.31
I don't think I can afford to take a vacation	1–5	3.04 ± 1.37
Unimportant meetings take up so much of my time that I lose a lot of time at work	1–5	2.59 ± 1.28
I just can't do enough work in a day	1–5	2.54 ± 1.23
Qualitative Overload		2.36 ± 1.01
My job seems to be getting more complicated	1–5	2.86 ± 1.35
Sometimes the work given to me by my superiors is too difficult or complicated	1–5	2.28 ± 1.14
My superiors expect more of me than I can handle	1–5	2.28 ± 1.12
I don't have enough training or experience to do my job properly	1–5	2.26 ± 1.17
There are unreasonable demands on my work from my superiors	1–5	2.10 ± 1.14

stress between specialty nurses who engaged in specialty nursing work full-time and part-time ($p > 0.05$). Gender, nature of the specialty nurse position, educational background, and work experience influenced specialty nurses' role stress (Table 3).

Specialty nurses' scores in each dimension of role stress were treated as dependent variables, and the statistically significant factors in the univariate analysis were treated as independent variables to perform multiple linear regression analysis. Gender, age, educational background, professional title, and work experience were treated as dummy variables, and the reference groups were gender (male), age ≤ 30 , diploma, primary nurse, and work experience ≤ 5 years, respectively. The results showed that gender ($p < 0.05$), educational background ($p < 0.05$), and work experience influenced role stress ($p < 0.05$, Table 4).

Discussion

This is the first large-scale survey on specialty nurses' role stress levels and the related risk factors thereof in the Chinese Mainland. The research subjects were selected from 11 tertiary hospitals in Henan Province, which improves the generalizability of the results. Currently, there is no clear grading standard for the degree of role stress, and there is a lack of norm for the role stress scale. Therefore, this study used the research results on the role stress scores of general nurses as a comparison, and found that the level of role stress among specialty nurses was higher than that of general nurses [36, 39, 40]. A possible reason is that compared with general nurses, specialty nurses face higher expectations and requirements from their managers. They are typically assigned to care for patients with more complex and severe conditions, and need to complete challenging tasks such as

Table 3 Univariate analysis of the role stress scores across the sample variables

Factors		Role ambiguity score	Role conflict score	Quantitative overload score	Qualitative overload score	Total scores
Gender	Female	11.02 ± 5.53	14.30 ± 6.56	14.56 ± 5.50	11.70 ± 5.00	51.59 ± 19.57
	Male	13.26 ± 7.51	17.54 ± 8.18	15.83 ± 5.51	13.13 ± 5.96	59.76 ± 24.92
	<i>t</i>	1.999	2.639	1.513	1.592	2.187
	<i>P</i>	0.051	0.011*	0.131	0.118	0.034*
Age (years)	≤ 30	11.88 ± 6.07	15.21 ± 7.30	13.99 ± 5.75	11.82 ± 5.32	52.89 ± 21.80
	31 < to ≤ 40	11.13 ± 5.62	14.35 ± 6.60	14.82 ± 5.48	11.88 ± 5.05	52.18 ± 19.72
	40 <	8.37 ± 3.54	13.08 ± 4.84	15.24 ± 4.43	10.61 ± 3.98	47.29 ± 13.99
	<i>F</i>	5.267	1.636	1.455	0.988	1.092
	<i>P</i>	0.001**	0.180	0.225	0.398	0.352
Department	Medical	11.09 ± 5.66	14.10 ± 6.66	14.45 ± 5.65	11.59 ± 5.15	51.22 ± 20.29
	Surgical	10.80 ± 5.37	14.89 ± 6.43	15.11 ± 5.32	11.94 ± 4.95	52.74 ± 19.29
	Gynecological	10.80 ± 5.82	13.10 ± 6.20	13.64 ± 5.23	11.62 ± 4.67	49.16 ± 18.29
	Pediatrics	11.36 ± 5.34	14.43 ± 6.82	13.86 ± 5.55	12.79 ± 5.48	52.43 ± 21.26
	Intensive Care Unit	11.95 ± 6.00	15.38 ± 7.06	14.76 ± 5.18	12.06 ± 5.25	54.15 ± 20.16
	Operating room	11.52 ± 6.23	14.98 ± 7.22	14.98 ± 5.21	11.54 ± 4.60	53.03 ± 19.53
	Emergency	12.89 ± 7.23	17.44 ± 8.69	16.61 ± 6.41	13.78 ± 5.96	60.72 ± 25.48
	Others	10.85 ± 4.45	14.31 ± 6.01	12.54 ± 6.35	11.69 ± 5.79	49.38 ± 19.86
	<i>F</i>	0.627	1.292	1.187	0.638	0.911
	<i>P</i>	0.734	0.251	0.308	0.725	0.497
Educational Background	Diploma	10.44 ± 5.67	15.22 ± 7.21	13.96 ± 5.60	11.42 ± 5.32	51.04 ± 20.48
	Bachelor's degree	11.11 ± 5.71	14.23 ± 6.60	14.54 ± 5.53	11.68 ± 5.05	51.56 ± 19.97
	Master's degree	12.43 ± 5.19	17.60 ± 7.05	16.74 ± 4.55	13.81 ± 4.79	60.57 ± 18.04
	<i>F</i>	1.597	5.966	3.963	4.080	4.605
<i>P</i>	0.203	0.003**	0.019*	0.017*	0.010*	
Professional Title	Primary nurse	9.94 ± 5.48	15.19 ± 7.17	13.75 ± 6.09	11.88 ± 5.07	50.75 ± 21.41
	Nurse practitioner	12.40 ± 6.59	15.60 ± 7.49	14.04 ± 5.67	11.82 ± 5.49	53.86 ± 22.77
	Supervisor nurse	10.92 ± 5.34	14.20 ± 6.48	14.86 ± 5.46	11.86 ± 4.98	51.84 ± 19.18
	Co-chief nurse	8.13 ± 3.34	12.45 ± 4.00	15.03 ± 4.82	10.50 ± 3.88	46.11 ± 12.63
	<i>F</i>	7.605	3.489	1.300	0.857	1.729
<i>P</i>	< 0.001***	0.015*	0.273	0.463	0.160	
Work Experience (years)	1 < to ≤ 5	12.61 ± 6.16	16.41 ± 7.39	15.02 ± 5.70	12.60 ± 5.49	56.63 ± 22.78
	6 < to ≤ 10	11.87 ± 6.30	14.68 ± 7.08	14.24 ± 5.63	11.94 ± 5.12	52.72 ± 20.67
	11 < to ≤ 15	10.70 ± 5.15	14.16 ± 6.37	14.81 ± 5.45	11.77 ± 4.92	51.43 ± 18.81
	16 < to ≤ 20	10.43 ± 5.36	13.71 ± 6.46	14.72 ± 5.28	11.46 ± 5.21	50.32 ± 19.92
	21 < to ≤ 25	9.50 ± 4.40	13.81 ± 5.12	14.47 ± 4.87	10.75 ± 4.35	48.53 ± 15.95
	25 <	7.50 ± 2.80	11.00 ± 4.09	14.25 ± 5.95	8.85 ± 3.69	41.60 ± 13.90
	<i>F</i>	4.410	3.119	0.665	2.287	2.563
<i>P</i>	< 0.001***	0.005**	0.678	0.034*	0.018*	
Mode of Appointment	Contract system	11.30 ± 5.67	15.06 ± 6.90	14.47 ± 5.36	12.17 ± 4.98	53.00 ± 19.98
	Human agency	11.15 ± 5.70	14.33 ± 6.63	14.57 ± 5.58	11.73 ± 5.13	51.77 ± 20.03
	Official staffing	10.92 ± 5.66	14.73 ± 6.93	15.32 ± 5.22	11.62 ± 4.85	52.59 ± 19.92
	<i>F</i>	0.116	0.691	0.807	0.463	0.241
	<i>P</i>	0.890	0.501	0.447	0.629	0.786

Table 3 (continued)

Factors		Role ambiguity score	Role conflict score	Quantitative overload score	Qualitative overload score	Total scores
Monthly Income (yuan)	≤ 5000	12.09 ± 6.57	15.52 ± 7.30	14.53 ± 5.85	11.78 ± 5.15	53.92 ± 21.86
	5000 < to ≤ 10,000	10.91 ± 5.67	14.24 ± 6.77	14.19 ± 5.39	11.49 ± 5.08	50.83 ± 20.11
	10,000 < to ≤ 15,000	11.27 ± 5.36	14.35 ± 6.43	15.09 ± 5.54	12.04 ± 5.02	52.76 ± 19.31
	15,000 <	9.65 ± 5.01	15.26 ± 5.98	16.42 ± 4.82	13.13 ± 5.01	54.45 ± 17.32
	<i>F</i>	1.728	0.933	1.980	1.107	0.837
	<i>P</i>	0.142	0.444	0.096	0.352	0.502
Whether to Participate in Specialty Nursing Outpatient Service	Yes	10.23 ± 5.68	14.02 ± 6.09	14.17 ± 5.35	11.18 ± 4.74	49.60 ± 19.34
	No	11.23 ± 5.68	14.54 ± 6.76	14.68 ± 5.52	11.84 ± 5.10	52.28 ± 20.04
	<i>t</i>	-1.350	-0.590	-0.715	-0.995	-1.031
	<i>P</i>	0.177	0.555	0.475	0.320	0.303
Nature of Specialty Nurse Position	Full-time job	9.60 ± 5.21	12.34 ± 5.25	13.17 ± 5.15	10.34 ± 4.30	45.46 ± 17.05
	Part-time job	11.22 ± 5.70	14.59 ± 6.75	14.70 ± 5.51	11.85 ± 5.09	52.37 ± 20.07
	<i>t</i>	-1.644	-1.937	-1.614	-1.723	-2.000
	<i>P</i>	0.101	0.053	0.107	0.085	0.046*

p*-value < 0.05; *p*-value < 0.01; ****p*-value < 0.001

specialist nursing outpatient services, consultations and discussions of difficult cases. Furthermore, we also found that the role stress of specialty nurses in tertiary general hospitals was mainly reflected in quantitative overload. This could be attributable to the overall shortage of registered nurses in China (with only 3.34 registered nurses per 1,000 people), and the low proportion of specialty nurses among all nurses [41]. This suggests that tertiary general hospitals need to reasonably increase the allocation of human resources for nursing, and strengthen the training of specialty nurses to meet the growing demand for clinical specialist nursing services.

We first selected two significant variables that are important methods of specialty nurse utilization and management to explore whether they would impact the role stress of specialty nurses: participation in specialty nursing outpatient service and the nature of the specialty nurse position. The results of the univariate analysis failed to statistically support a direct correlation between these variables and role stress. This could be attributable to the low proportion of full-time specialty nurses in our study as well as those participating in outpatient services, which would have affected statistical power. Nevertheless, we still emphasize the potential practical importance of these variables. The reasons may be as follows. Pamela's stress and coping transactional theory points out that an individual's stress experience and coping behavior are interrelated and jointly influenced by individual characteristics and environmental factors [42]. When the external environment

(e.g., job settings and requirements) aligns with one's own characteristics (e.g., ability level and professional value), the individual will regard work as a kind of self-expression, thereby generating a positive work attitude. This positive attitude can help alleviate the individual's stress experience. Studies have confirmed that reasonable post-management and specialty nursing outpatient services are crucial for enhancing specialty nurses' sense of professional worth and work enthusiasm [43, 44]. Therefore, we recommend that healthcare institutions should fully consider the individual needs and work characteristics of specialty nurses, establish scientific full-time and part-time positions, and provide them with opportunities to work in specialty nursing outpatient services. Such measures could help mitigate the effects of role stress on specialist nurses.

In terms of role ambiguity, we found that with increased work experience, specialty nurses' role ambiguity will decrease, which is consistent with a previous study [27]. Role ambiguity occurs when medical staff assume multiple roles, such as treating patients, conducting research, teaching junior colleagues, and performing administrative duties [33]. Owing to a lack of hierarchical management of specialty nurses and unclear role positioning and job responsibilities, specialty nurses with less work experience have relatively high levels of role ambiguity. This could cause less experienced specialty nurses to be assigned work that does not align with their abilities. To address this, we recommend implementing a hierarchical management

Table 4 Multivariate linear regression analysis of demographic data for each dimension

Factors	R ²	Variable	Unstandardized coefficients		Standardized coefficients	t	p	95% CI
			B	Std. error	Beta			
Role ambiguity	0.211		9.878	1.403		7.043	< 0.001***	7.125, 12.632
		31–40 years old	1.398	0.707	0.115	1.976	0.048*	0.009, 2.786
		> 40 years old	-0.147	1.379	-0.006	-0.107	0.915	-2.855, 2.560
		Nurse practitioner	2.890	1.484	0.222	1.948	0.052	-0.022, 5.803
		Supervisor nurse	1.844	1.534	0.152	1.202	0.230	-1.167, 4.854
		Co-chief nurse	-0.232	1.819	-0.009	-0.128	0.898	-3.802, 3.338
		6–10 years	-1.094	0.736	-0.087	-1.488	0.137	-2.538, 0.350
		11–15 years	-2.462	0.900	-0.212	-2.736	0.006**	-4.229, -0.696
		16–20 years	-2.154	1.054	-0.115	-2.043	0.041*	-4.223, -0.085
		21–25 years	-2.027	1.439	-0.074	-1.408	0.160	-4.852, 0.799
> 25 years	-3.768	2.066	-0.081	-1.824	0.069	-7.823, 0.287		
Role conflict	0.209		17.733	1.908		9.292	< 0.001***	13.987, 21.479
		Female	-2.777	1.026	-0.097	-2.706	0.007**	-4.791, -4.791
		Bachelor's degree	-0.567	1.010	-0.028	-0.562	0.574	-2.550, -2.550
		Master's degree	2.448	1.417	0.086	1.728	0.084	-0.333, -0.333
		Nurse practitioner	1.283	1.793	0.083	0.716	0.474	-2.236, 4.801
		Supervisor nurse	0.583	1.889	0.041	0.309	0.758	-3.126, 4.292
		Co-chief nurse	-0.709	2.219	-0.023	-0.320	0.749	-5.065, 3.646
		6–10 years	-1.019	0.825	-0.069	-1.236	0.217	-2.638, 0.599
		11–15 years	-1.101	0.901	-0.080	-1.222	0.222	-2.869, 0.668
		16–20 years	-1.278	1.102	-0.058	-1.160	0.246	-3.442, 0.885
21–25 years	-0.751	1.438	-0.023	-0.522	0.602	-3.574, 2.072		
> 25 years	-4.861	2.146	-0.088	-2.265	0.024*	-9.074, -0.649		
Quantitative overload	0.100		13.960	0.775		18.019	< 0.001***	12.439, 15.481
		Bachelor's degree	0.583	0.802	0.035	0.727	0.467	-0.991, 2.157
		Master's degree	2.785	1.113	0.120	2.502	0.013 *	0.600, 4.969
Qualitative overload	0.164		12.993	1.031		12.598	< 0.001***	10.968, 15.018
		Female	-1.241	0.772	-0.057	-1.607	0.108	-2.757, 0.275
		Bachelor's degree	0.344	0.743	0.022	0.463	0.644	-1.114, 1.802
		Master's degree	2.235	1.025	0.104	2.179	0.030*	0.222, 4.248
		6–10 years	-0.341	0.569	-0.030	-0.599	0.550	-1.457, 0.776
		11–15 years	-0.442	0.547	-0.043	-0.808	0.420	-1.515, 0.632
		16–20 years	-0.719	0.727	-0.043	-0.989	0.323	-2.146, 0.709
		21–25 years	-1.336	0.965	-0.055	-1.384	0.167	-3.231, 0.559
		> 25 years	-4.455	1.526	-0.107	-2.919	0.004**	-7.451, -1.459
		Role stress	0.181		60.218	4.055		14.849
Female	-7.248			3.037	-0.085	-2.387	0.017*	-13.209, -1.286
Bachelor's degree	1.302			2.921	0.021	0.446	0.656	-4.431, 7.035
Master's degree	9.016			4.032	0.106	2.236	0.026*	1.101, 16.931
6–10 years	-2.516			2.237	-0.057	-1.125	0.261	-6.908, 1.875
11–15 years	-3.379			2.150	-0.083	-1.572	0.116	-7.599, 0.841
16–20 years	-4.366			2.859	-0.067	-1.527	0.127	-9.979, 1.247
21–25 years	-5.708			3.795	-0.059	-1.504	0.133	-13.158, 1.742
> 25 years	-16.805			6.002	-0.103	-2.800	0.005**	-28.586, -5.024

* p -value < 0.05, ** p -value < 0.01, *** p -value < 0.001

95%CI/ 95% Confidence Interval

system and clarifying job responsibilities to ensure that specialty nurses are assigned tasks that are suitable for their level of experience and expertise.

In the role conflict dimension, one interesting finding of this study is that male specialty nurses experienced higher levels of role conflict than their female counterparts, which is inconsistent with previous studies [45]. It may be related to the fact that although male specialty nurses do not face as much pressure regarding supervising and caring for children as females do, most are staffing departments such as emergency, critical care, and operating rooms. The workload, labor intensity, and difficulty of specialized nursing work in these departments are more significant than in other departments [46]. In addition, studies reveal that male nurses experience more intense role conflict than female nurses due to the deep-rooted stereotype of nursing being a female profession. They may be inadequately trained to provide personal care services to female patients and feel their families do not support their profession. Research on nurses facing role stress posits that male nurses feel greater tension and anxiety than female nurses. Such stress can affect male nurses differently, causing role confusion and conflict, restricting career development, and compelling them to switch to non-nursing careers, thus making them reluctant to pursue nursing professionally [47]. Moreover, role and interpersonal conflict may lead to feeling additionally burdened and increase work stress [18]. It is necessary for nursing managers to increase the allocation of human resources in emergency departments, intensive care units, and other departments to alleviate the role stress of specialty nurses. Simultaneously, it is important to optimize the nursing organizational culture; and create a friendly, respectful, and harmonious team atmosphere, so that male nurses feel that their value is recognized and accepted. In addition, strengthening psychological support for male specialty nurses, establishing communication platforms for them, and inviting outstanding male nurse specialists to share their experiences can stimulate male nurses' professional identity and reduce their role conflict [32, 48].

In respect of role overload, our results revealed that specialty nurses with less work experience faced a higher level of qualitative overload than that of experienced specialty nurses. This difference possibly reflects that inexperienced specialty nurses lack the competence to manage complex, specialized nursing problems, making them easily stressed when dealing with such issues. Thus, we suggest that managers provide continuous training for inexperienced specialty nurses to improve their job competency. Our research further discovered that the specialty nurses with higher degrees of educational qualifications have higher quantitative overload

and qualitative overload than that of specialty nurses with lower degrees of educational qualifications. These findings were consistent with previous studies [32, 49]. It may be related to specialty nurses with higher educational qualifications being required to undertake significantly more and more complex research tasks compared to those with lower qualifications [50]. Therefore, we recommended that administrators create full-time roles for highly educated specialty nurses and offer extra support like performance incentives and learning opportunities to mitigate the impact of role overload.

Limitations

The study has a few limitations. First, the survey was conducted online, which may have caused sample selection bias. Second, the samples were selected from tertiary general hospitals in China and did not include specialized hospitals or primary institutes, which may limit the generalizability of the findings. We did not obtain the survey participants through probability-sampling strategies, which is also among the factors limiting the generalizability of our research results. Third, the influencing factors included in this study may be insufficiently comprehensive. More factors still need to be explored.

Conclusion

This study found that, compared with general nurses, specialty nurses in tertiary general hospitals had higher levels of role stress. Their role stress is primarily reflected in role overload, followed by role conflict and ambiguity. Specialty nurses' gender, work experience, and educational background can influence survey results. Additionally, it is strongly advised that support measures should be given to male and highly educated specialty nurses to make them more positive. Providing training for less experienced specialty nurses to improve their job competency is essential. This study will increase understanding of the status of role stress among specialty nurses in China, thereby laying the foundation for developing role stress intervention strategies for specialty nurses.

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Authors' contributions

PZ, BZ, and JL contributed to the conception and design of the research and performed the statistical analysis. SL and YL wrote the manuscript. FL and HZ critically reviewed and revised the manuscript. All authors collaborated on the manuscript revision, read, and approved the submitted version.

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Availability of data and materials

Data related to this study are available from the corresponding author upon reasonable request.

Declarations**Ethics approval and consent to participate**

The study was reviewed and approved by the ethics committee of Zhengzhou University (ZZUIRB2023192). (2023–05–15). The participants provided written informed consent to participate in this study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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