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Latent profile analysis of missed nursing care and their predictors among neuro-oncology nurses: a multicenter cross-sectional study

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Abstract

Purpose To explore potential profile characteristics associated with neuro-oncology nurses' missed nursing care (MNC) and analyze differences in characteristics of neuro-oncology nurses across these profiles.

Methods A cross-sectional study design using convenience sampling involved 446 neuro-oncology nurses from ten Grade A oncology hospitals across six provinces in China, conducted from April to June 2024. The General Information Questionnaire, the Oncology Missed Nursing Care Self-Rating Scale, the Practice Environment Scale, and the Psychological Capital Scale were employed for data collection. Latent profile analysis was performed to identify MNC profiles, followed by multinomial logistic regression analysis to examine predictors of MNC.

Results The incidence of MNC among neuro-oncology nurses was found to be 36.4%. Three latent profiles were identified: "severe missed nursing care profile" (20.6%), "medium-risk missed nursing care profile" (51.3%), and 'low-risk missed nursing care profile' (28.1%). Compared with the "severe missed nursing care profile," neuro-oncology nurses with a technical secondary school or junior college education, who expressed job satisfaction, good self-confidence, and mental resilience were more likely to fall into the "medium-risk missed nursing care profile." Additionally, those aged 18–35 years were more likely to be categorized in the "low-risk missed nursing care profile," and nurses working in a positive nursing work environment were also more likely to belong to the "medium-risk" or "low-risk missed nursing care profiles."

Conclusion There is notable heterogeneity in the levels of missed nursing care among neuro-oncology nurses. Nursing managers should prioritize addressing middle-risk missed nursing care and enhancing both the working environment and psychological support for neuro-oncology nurses. Tailored interventions based on the distribution of different profiles can improve nursing quality, increase job satisfaction, and enhance patient outcomes.

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Keywords Neuro-oncology nurses, Missed nursing care, Latent profile analysis, nursing work environment, psychological capital

Background

With advancements in modern biomedicine, the survival rates of brain tumor patients have improved, yet they face significant pressures related to treatment, physical health, emotional well-being, and spiritual concerns [1]. Patients with malignant brain tumors experience rapid fluctuations in their health status. Nursing is a critical component of healthcare, and the quality of nursing services directly impacts patient safety [2]. Insufficient nurse-to-patient ratios contribute to a decline in care quality. Consequently, variations in nursing quality often arise during clinical practice, with missed nursing care (MNC) being a key contributing factor. MNC occurs when necessary nursing interventions are either not performed or are delayed due to various reasons [3]. While MNC may be less detectable than nursing errors, it can lead to severe consequences, including adverse patient events, readmissions, fatalities, and increased turnover intentions among nursing staff [4–6]. Between 55% and 98% of nurses report having missed or incomplete nursing measures at work, with the miss rate for basic nursing and care planning exceeding 70% [7–10].

The nursing work environment comprises various elements that directly or indirectly affect the nursing system, including resources, personnel, and surrounding materials. Studies show that nursing units with favorable work environments have a 63.3% lower likelihood of nursing activity omissions compared to those with poor environments [11]. Enhancing the nursing work environment is essential for reducing MNC [12]. Research conducted in South Korea reveals that staffing levels, resource adequacy, and the leadership capabilities of nursing managers significantly impact nursing deficiencies [13]. Similarly, in the United States, these same factors, along with a foundation for providing high-quality nursing care, are closely associated with nursing deficiencies [14].

Prior studies have found that individuals with higher levels of psychological capital are better equipped to adapt to and mitigate the adverse effects of burnout in the nursing profession [15, 16]. According to stress process theory [17], the demanding nature of nursing work can precipitate elevated burnout levels, potentially leading to stress responses such as MNC. Therefore, both the nursing work environment and psychological capital are crucial factors that benefit hospitals, nurses, and patients alike. Addressing how to improve nursing care quality and reduce nursing deficiencies has become a primary focus for nurse managers and nursing practice.

Exploring various models of nurse manager competency (MNC) alongside tailored intervention strategies is crucial for enhancing nursing quality and job satisfaction. This approach enables nurse managers to provide targeted support to nurses in suboptimal work environments with low psychological capital. While numerous studies have investigated MNC among oncology nurses, most have utilized variable-centered analysis methods—focusing on relationships between nursing MNC, work environment, and burnout—which may overlook individual variability [13–16]. Moreover, existing research comparing MNC across nations has yet to define specific threshold values or provide relevant benchmarks [18, 19]. In this context, relying solely on mean scores often oversimplifies the issue, failing to distinguish between nurse subcategories with differing MNC levels; a "person-centered" approach is thus more appropriate [20].

Latent profile analysis (LPA), a personalized classification technique, offers a range of model fit indices to guide optimal model selection. Recently, LPA has gained traction in fields such as psychology, medicine, nursing management, and education [21]. This method can categorize individuals based on data, capture group heterogeneity, and objectively assess neuro-oncology nurses' MNC—a critical factor for addressing nursing deficiencies and developing targeted intervention strategies. Consequently, investigating patterns of MNC among neuro-oncology nurses using LPA and examining the interplay between their work environment, psychological capital, and MNC patterns may elucidate the positive impacts of MNC on medical institutions, patients, and nurses.

In this study, we employed LPA to (a) explore distinct characteristics of MNC among neuro-oncology nurses, (b) identify these characteristics, and (c) compare the nursing work environment and psychological capital across varying MNC levels. This analysis aims to provide targeted interventions that reduce MNC, enhance nursing quality and job satisfaction, and ultimately improve patient outcomes.

Materials and methods

Study participants and procedures

We conducted a cross-sectional survey involving neuro-oncology nurses from ten Grade A oncology hospitals across six Chinese provinces: Guangxi, Shanghai, Henan, Tianjin, Guangdong, and Chongqing, from April to June 2024. All neuro-oncology nurses were invited to participate in a self-administered questionnaire survey using convenience sampling. Inclusion criteria were as follows: (1) qualified clinical nurse practitioners working in a

neuro-oncology department; (2) a minimum of 1 year of clinical experience; and (3) ability to read and communicate in Chinese. Exclusion criteria included (1) nurses on leave; and (2) nurses not directly involved in clinical care.

Sample size

According to Kendall's empirical rule [22], this study included 26 independent variables, comprising 11 variables from general information, as well as 4 dimensions from the oncology missed nursing care self-rating scale, 5 dimensions related to the nursing work environment, and 6 dimensions from psychological capital. To ensure robust statistical validity, the sample size was calculated to be 10 to 15 times the number of variables, while also accounting for a potential 10% sample loss, the required sample size for the study should be between 289 and 433. Our study included 446 participants, meeting the specified sample size requirements.

Data collection

Survey links were distributed to neuro-oncology nurses, who were invited to participate voluntarily. Participation was considered as consent, which was further confirmed upon completion and submission of the online survey. We implemented rigorous quality control measures throughout the survey administration process: ① Standardized Instruments: The Oncology Missed Nursing Care Self-Rating Scale widely used in China, demonstrates high reliability and validity and was employed to assess the impact of MNC among oncology nurses. Prior to data collection, we conducted a pilot test with 30 neuro-oncology nurses to refine item clarity and cultural appropriateness; ② Training of Data Collectors: Research assistants at each hospital received a 4-hour training session on survey administration, focusing on maintaining question neutrality and implementing methods to minimize social desirability bias. Subsequently, the research assistants distributed the survey questionnaire link to ward nurses; ③ Data Verification: All completed questionnaires were checked for completeness by two independent researchers. Missing or ambiguous responses (e.g., skipped items) were clarified via follow-up calls within 24 h; ④ Double Data Entry: Data were independently entered into EpiData software by two team members, and inconsistencies were resolved by referring to the original paper records.

Measurements

General information questionnaire

A general information questionnaire was utilized to gather participant characteristics, including age, sex, education, marital status, working hours per shift, years of employment, weekly overtime, professional title, monthly night shifts, shift patterns, and job satisfaction.

Oncology missed nursing care self-rating scale

The Oncology Missed Nursing Care Self-Rating Scale (OMNCS) [23], widely used in China, demonstrates high reliability and validity and was employed to assess the impact of missed nursing care (MNC) among oncology nurses. This 33-item scale encompasses four domains: nursing assessment, care planning, primary care, and nursing intervention. Each item is rated on a 5-point scale from 1 (always have been) to 5 (never before). Total scores range from 30 to 180, with higher scores indicating a lower impact of MNC. It should be noted that the scoring system is inversely related to missed nursing care, with higher total scores indicating fewer occurrences of MNC. In this study, the scale's Cronbach's α coefficient was 0.95, and its test-retest reliability was 0.90.

Practice environment scale

The nursing work environment was evaluated using the Practice Environment Scale (PES) [24], a 31-item instrument covering five domains: nurse participation in hospital affairs, high-quality nursing services, the abilities and leadership styles of nursing managers, availability of human and material resources, and collaboration between medical and nursing staff. Items are rated on a 4-point Likert scale from "strongly disagree" to "strongly agree." Total scores range from 31 to 124, with higher scores indicating a more favorable nursing work environment. In this study, the PES achieved a Cronbach's α coefficient of 0.91, and its test-retest reliability was 0.94.

Psychological capital scale

The Psychological Capital Scale (PCS) was employed to assess the psychological impact of psychological capital on nurses over the past week [25]. This 30-item measure encompasses six domains: hope, communication facilitation, emotional intelligence, sense of responsibility, resilience, and self-confidence. Items are presented on a 6-point Likert scale from "strongly disagree" to "strongly agree." Total scores range from 31 to 124, with higher total scores indicating a greater impact of psychological capital. The PCS exhibited a Cronbach's α coefficient of 0.91 in this study, with a test-retest reliability of 0.94.

Data analysis

Statistical analyses, including descriptive statistics, logistic regression, and one-way analysis of variance were performed using SPSS 27.0 software. Latent profile analysis was conducted using Mplus 8.3. The adaptation indices for the potential profile model included: (1) Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and Adjusted Bayesian Information Criterion (aBIC), where lower values indicate better model fit [21]; (2) Entropy, which measures classification accuracy on a scale from 0 to 1, with higher values reflecting greater

precision [21]; and (3) significance testing of P-values via the Lo-Mendell Rubin Likelihood Test (LMR) and the bootstrap likelihood ratio test (BLRT). A p-value of less than 0.05 indicates that the current model significantly outperforms the previous model [26]. This study conducted a comprehensive evaluation of each model to determine the optimal one. Logistic regression analyses were employed to assess the impact of demographic factors on the missed nursing care (MNC) of various profiles of neuro-oncology nurses. Evaluate the nursing work environment and psychological capital among neuro-oncology nurses with diverse MNC profiles.

Results

Of the 446 neuro-oncology nurses who participated in this study, the largest proportion, 271 (60.8%), were aged 18 to 35 years. A total of 415 (93%) were female, while 31 (7%) were male. Additionally, 248 (55.6%) were married, and 354 (79.4%) held a college degree or higher. Among the participants, 208 (46.6%) were nurse supervisors, 154 (34.5%) had 11 to 20 years of experience, 268 (60.1%) worked 9 to 15 h per shift, and 275 (61.7%) reported being generally satisfied with their jobs (Table 1).

Latent profiles of relational missed nursing care among neuro-oncology nurses

During the exploratory analysis, five models were estimated, with fit metrics presented in Table 2. Notably, the entropy of the three-profile model surpassed that of the four-profile model, while the Log(L), AIC, BIC, and aBIC values decreased progressively. The LMR value for the five-class model ($p = 0.054$) was not statistically significant. Considering both the fit indices and practical significance, the three-profile latent model was selected as the

Table 1 Demographic characteristics of three latent profiles [cases (percentages, %)]

Variable	Group	All samples (*n* = 446)	Profile 1 (*n* = 92)	Profile 2 (*n* = 229)	Profile 3 (*n* = 125)	F/t	*p*
Sex	Male	31 (7.0)	14 (15.2)	12 (5.2)	5 (4.0)	0.016	0.900
	Female	415 (93.0)	78 (84.8)	217 (94.8)	120 (96.0)		
Age (years)	18–35	271 (60.8)	71 (77.2)	163 (71.2)	37 (29.6)	8.270	0.004*
	36–55	175 (39.2)	21 (22.8)	66 (28.8)	88 (70.4)		
Marital status	Unmarried	195 (43.7)	40 (43.5)	99 (43.2)	56 (44.8)	2.210	0.111
	Married	248 (55.6)	52 (56.5)	130 (56.8)	66 (52.8)		
	Divorced	3 (0.7)	0 (0.0)	0 (0.0)	3 (2.4)		
Education	Technical secondary school or junior college	92 (20.6)	12 (13.0)	62 (27.1)	18 (14.4)	31.933	<0.001*
	College degree or above	354 (79.4)	80 (87.0)	167 (72.9)	107 (85.6)		
Professional title	Nurse	78 (17.5)	28 (30.4)	37 (16.2)	13 (10.4)	16.270	<0.001*
	Nurse practitioner	139 (31.2)	31 (33.7)	83 (36.2)	25 (20.0)		
	Supervisor nurse	208 (46.6)	30 (32.6)	103 (45.0)	75 (60.0)		
	Deputy chief nurse or above	21 (4.7)	3 (3.3)	6 (2.6)	12 (9.6)		
Working hours per shift (h)	≤ 8	178 (39.9)	18 (19.6)	88 (38.4)	72 (57.6)	0.003	0.958
	9–15	268 (60.1)	74 (80.4)	141 (61.6)	53 (42.4)		
Number of night shifts per month	≤ 2	140 (31.4)	30 (32.6)	65 (28.4)	45 (36.0)	4.210	0.041*
	3–6	306 (68.6)	62 (67.4)	164 (71.6)	80 (64.0)		
Weekly overtime	Seldom	71 (15.9)	7 (7.6)	42 (18.3)	22 (17.6)	1.599	0.189
	Now and then	239 (53.6)	51 (55.4)	117 (51.1)	71 (56.8)		
	Frequently	128 (28.7)	31 (33.7)	68 (29.7)	29 (23.2)		
	Always	8 (1.8)	3 (3.3)	2 (0.9)	3 (2.4)		
Shift situation	Regular day shift	75 (16.8)	21 (22.8)	40 (17.5)	14 (11.2)	0.071	0.791
	Take turns	371 (83.2)	71 (77.2)	189 (82.5)	111 (88.8)		
Working years	1–5	120 (26.9)	25 (27.2)	65 (28.4)	30 (24.0)	0.218	0.884
	6–10	126 (28.3)	27 (29.3)	67 (29.3)	32 (25.6)		
	11–20	154 (34.5)	31 (33.7)	77 (33.6)	46 (36.8)		
	> 20	46 (10.3)	9 (9.8)	20 (8.7)	17 (13.6)		
Job satisfaction	Satisfied	101 (22.6)	21 (22.8)	71 (31.0)	9 (7.2)	15.076	<0.001*
	Normal	275 (61.7)	55 (59.8)	131 (57.2)	89 (71.2)		
	Dissatisfied	70 (15.7)	16 (17.4)	27 (11.8)	27 (21.6)		

Profile 1, severe missed nursing care profile; Profile 2, medium-risk missed nursing care profile; Profile 3, low-risk missed nursing care profile; p, p value; *$p<0.05$

Table 2 Fit statistics for LPA models of missed nursing care in neuro-oncology nurses

Model	K	Log(L)	AIC	BIC	a BIC	Entropy	LMR	BLRT
Profile 1	8	−6121.262	12258.524	12291.327	12265.938			
Profile 2	13	−5933.898	11893.795	11947.100	11905.843	0.886	<0.001	<0.001
Profile 3	**18**	**−5799.484**	**11634.968**	**11708.773**	**11651.649**	**0.898**	**<0.001**	**<0.001**
Profile 4	23	−5700.465	11446.931	11541.238	11468.246	0.891	<0.001	<0.001
Profile 5	28	−5654.225	11364.450	11479.259	11390.398	0.897	0.054	<0.001

k, number of free parameters; Log(L), Log-likelihood value; AIC, Akaike information criterion; BIC, Bayesian information criteria; aBIC, adjusted Bayesian information criteria; LMR, Lo–Mendell–Rubin Test; BLRT, bootstrap likelihood ratio test

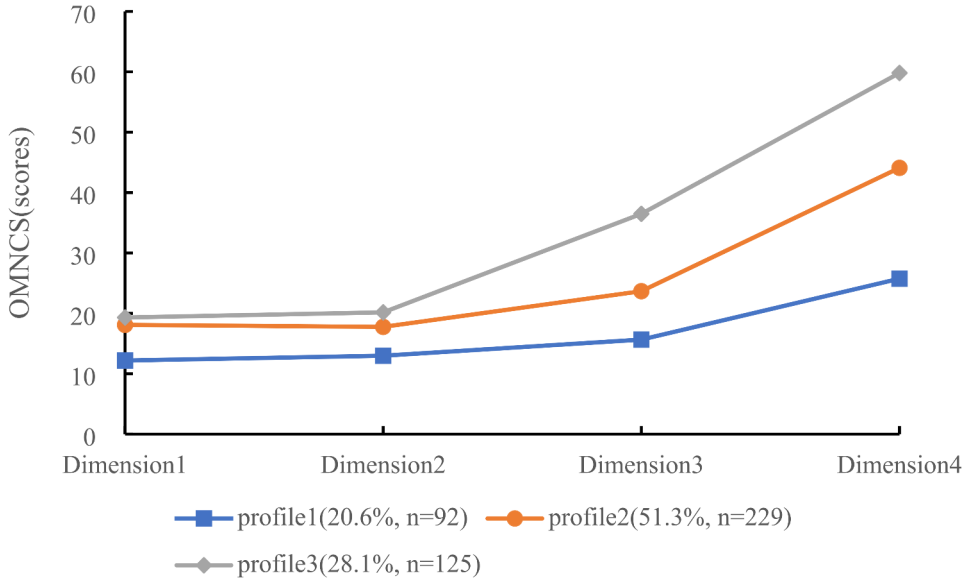

Fig. 1 Latent profiles of missed nursing care among neuro-oncology nurses. Profile 1, severe missed nursing care profile; Profile 2, medium-risk missed nursing care profile; Profile 3, low-risk missed nursing care profile; OMNCS, Oncology Missed Nursing Care Self-Rating Scale; dimension 1, nursing assessment; dimension 2, care planning; dimension 3, primary care; dimension 4, nursing intervention

optimal model for MNC among neuro-oncology nurses, with key metrics highlighted in bold in Table 2.

The scores for the three profiles across four dimensions are illustrated in Fig. 1. Profile 1, designated as the "severe missed nursing care profile," comprised 20.6% ($n = 92$) of participants. Profile 2, characterized by moderate levels across all items, was termed the "medium-risk missed nursing care profile," representing 51.3% ($n = 229$) of the sample. Profile 3, referred to as the "low-risk missed nursing care profile," accounted for 28.1% ($n = 125$). The overall MNC scores for profiles 1, 2, and 3 were 66.00 ± 10.24, 103.70 ± 10.49, and 135.90 ± 13.58, respectively (Table 3).

Univariate analysis of latent profile categories

Our study revealed statistically significant differences ($p < 0.05$, Tables 1 and 3) across three potential trait categories among neuro-oncology nurses concerning MNC based on age, education, professional title, number of night shifts per month, job satisfaction, total PES scores, and dimensions of emotional quotient, sense of responsibility, toughness, and self-confidence within psychological capital.

Multinomial logistic regression analysis of latent profile categories

To identify predictors of MNC, we conducted a multinomial logistic regression analysis, using the "severe missed nursing care profile" as the reference. Independent variables were categorized as follows: Age (years): 18–35 = 1, 36–55 = 2; Education: technical secondary school or junior college = 1, college degree or above = 2; Professional title: nurse = 1, nurse practitioner = 2, supervisor nurse = 3, deputy chief nurse or above = 4; Number of night shifts per month: ≤ 2 = 1, 3–6 = 2; Job satisfaction: satisfied = 1, normal = 2, dissatisfied = 3; and the total PES score, along with dimensions of psychological capital, including emotional quotient, sense of responsibility, mental toughness, and self-confidence.

Our study revealed that neuro-oncology nurses aged 18–35 were significantly more likely to belong to the "low-risk missed nursing care profile" (OR = 0.151, $p < 0.001$). Nurses with a technical secondary school or junior college education were more likely to fall into the 'middle-risk missed nursing care profile' (OR = 2.807, $p = 0.011$). Additionally, nurses satisfied with their

Table 3 Classification of latent profiles of the scores of the OMNCS, PES, and PCS ($n = 446$, mean ± SD)

Variable	All samples ($n = 446$) Mean ± SD	Profile 1 ($n = 92$) Mean ± SD	Profile 2 ($n = 229$) Mean ± SD	Profile 3 ($n = 125$) Mean ± SD	*F*	*p* value
OMNCS	104.95 ± 26.70	66.00 ± 10.24	103.70 ± 10.49	135.90 ± 13.58		
Nursing assessment	17.21 ± 5.23	12.16 ± 2.09	18.07 ± 4.64	19.36 ± 5.53	9.471	<0.001*
Care planning	17.45 ± 4.75	12.88 ± 2.10	17.79 ± 3.95	20.18 ± 5.10	9.449	<0.001*
Primary care	25.60 ± 8.17	15.51 ± 3.07	23.68 ± 3.21	36.54 ± 3.29	36.621	<0.001*
Nursing intervention	44.70 ± 15.47	25.45 ± 7.17	44.17 ± 12.06	59.82 ± 6.88	43.937	<0.001*
PES	82.31 ± 21.93	69.17 ± 27.44	85.18 ± 14.86	86.71 ± 24.60	6.056	<0.001*
Nurses participate in hospital affairs	23.21 ± 6.96	19.90 ± 8.24	23.89 ± 5.52	24.39 ± 7.58	3.814	<0.001*
High-quality nursing services	25.92 ± 8.27	21.92 ± 9.43	26.64 ± 6.98	27.54 ± 8.66	4.070	<0.001*
Abilities and leadership styles of nursing managers	13.83 ± 3.93	11.49 ± 4.80	14.44 ± 2.74	14.42 ± 4.45	5.881	<0.001*
Adequate human and material resources	10.53 ± 3.26	9.01 ± 3.87	10.85 ± 2.74	11.07 ± 3.60	4.298	<0.001*
Collaboration between medical and nursing staff	8.83 ± 2.19	6.85 ± 2.75	9.36 ± 1.43	9.30 ± 2.08	7.363	<0.001*
PCS	117.37 ± 43.90	84.82 ± 50.04	119.21 ± 38.12	137.97 ± 34.43	3.867	<0.001*
Hope	28.32 ± 9.37	24.00 ± 11.37	28.91 ± 8.77	30.40 ± 7.76	1.238	0.094
Assist in communication	24.43 ± 8.49	19.87 ± 10.64	24.65 ± 8.06	27.38 ± 5.66	1.294	0.056
Emotional quotient	19.78 ± 7.45	16.52 ± 8.59	19.57 ± 7.32	22.56 ± 5.54	1.356	0.031*
Sense of responsibility	15.64 ± 5.85	12.58 ± 6.71	15.74 ± 5.66	17.72 ± 4.40	1.446	0.012*
Toughness	15.36 ± 5.73	12.46 ± 6.49	15.38 ± 5.56	17.46 ± 4.41	1.461	0.010*
Self-confidence	15.23 ± 5.95	13.00 ± 6.44	14.96 ± 5.99	17.36 ± 4.71	1.579	0.002*

OMNCS, Oncology Missed Nursing Care Self-Rating Scale; PES, Practice Environment Scale; PCS, Psychological Capital Scale; Profile 1, severe missed nursing care profile; Profile 2, medium-risk missed nursing care profile; Profile 3, low-risk missed nursing care profile; SE, standard error; F, variance ratio; * $p<0.05$

positions were also more likely to enter the "medium-risk missed nursing care profile" (OR = 2.577, $p = 0.042$). A positive nursing work environment increased the likelihood of entering both the "middle-risk" (OR = 1.034, $p < 0.001$) and "low-risk" (OR = 1.033, $p < 0.001$) profiles. Furthermore, neuro-oncology nurses exhibiting high self-confidence and mental toughness were more likely to be classified as "medium-risk" (OR = 0.85, $p = 0.006$; OR = 1.150, $p = 0.039$; Table 4).

Discussion

Latent profiles of missed nursing care

Evaluating and intervening in MNC among neuro-oncology nurses is vital for elevating nursing quality and improving outcomes for brain tumor patients. The incidence of MNC among neuro-oncology nurses was found to be 36.4%, consistent with previous findings [7–9], yet significantly lower than Park's results of 84.1% [11]. This discrepancy may stem from differing cultural perceptions of nursing deficiencies [27], indicating that MNC among neuro-oncology nurses remains a concern. Given the high malignancy of brain tumors and the rapid deterioration of patients' health, the nursing workload is complex and demanding. Additionally, the nurse-to-patient ratio is inadequate, leading to heavy workloads and potential delays in medical communication and collaboration. Prior studies have documented the significant stress oncology nurses face, including challenges related to workload, time management, work environment, resource availability, professional development, and patient care [28–30].

This study employed latent profile analysis and found that MNC among neuro-oncology nurses can be categorized into three distinct latent classes, with significant individual differences observed. ① Low-risk missed nursing care profile. Neuro-oncology nurses account for 28.1% of this category, with an OMNCS score of 135.90 ± 13.58. These nurses possess strong positive initiative, execution ability, and communication skills, which enhance their work efficiency, thereby reducing the likelihood of nursing deficiencies. ② Medium-risk missed nursing care profile. 51.3% of neuro-oncology nurses fall into this category, with an OMNCS score of 103.70 ± 10.49. The average scores on each item of the scale positioned in the middle among the three categories. Nurses in the "medium-risk missed nursing care profile" are likely to be the primary group experiencing MNC. ③ Severe missed nursing care profile. Neuro-oncology nurses account for 20.6% of this category, with an OMNCS score of 66.00 ± 10.24. It should be noted that the scoring system is inversely related to missed nursing care, with higher total scores indicating fewer occurrences of MNC. Scores on all dimensions of MNC being lower than the other two categories. Notably, the nursing assessment dimension has the lowest scores, which may be related to the management's focus on basic nursing implementation and enhancing nursing intervention capabilities. This could result in nurses not conducting

Table 4 Three latent profiles' probability matrices of missed nursing care in neuro-oncology nurses

Variable	Groups	Profile 2					Profile 3				
		B	SE	OR	95% CL	*p*	*B*	SE	OR	95% CL	*p*
Age (years)	18–35	−0.278	0.365	0.758	0.371–1.548	0.446	−1.893	0.402	0.151	0.068–0.331	<0.001
	36–55*										
Education	Technical secondary school or junior college	1.032	0.405	2.807	1.269–6.210	0.011	0.068	0.486	1.070	0.413–2.774	0.889
	College degree or above*										
Professional title	Nurse	−0.803	0.866	0.448	0.082–2.444	0.354	−0.571	0.906	0.565	0.096–3.338	0.529
	Nurse practitioner	0.136	0.832	1.146	0.224–5.855	0.870	−0.566	0.847	0.568	0.108–2.989	0.504
	Supervisor nurse	0.487	0.800	1.628	0.339–7.814	0.543	−0.346	0.797	0.708	0.148–3.374	0.664
	Deputy chief nurse or above*										
Number of night shifts per month	≤ 2	−0.027	0.311	0.974	0.529–1.792	0.932	0.412	0.358	1.510	0.749–3.044	0.249
	3–6 *										
Job satisfaction	Satisfied	0.947	0.465	2.577	1.036–6.409	0.042	−1.071	0.603	0.343	0.105–1.117	0.076
	Normal	0.064	0.397	1.066	0.490–2.320	0.872	−0.086	0.431	0.918	0.395–2.135	0.842
	Dissatisfied*										
PES		0.033	0.006	1.034	1.021–1.047	<0.001	0.033	0.008	1.033	1.018–1.049	<0.001
Emotional quotient		−0.033	0.046	0.968	0.885–1.059	0.475	0.034	0.051	1.034	0.937–1.142	0.504
Sense of responsibility		0.116	0.069	1.122	0.981–1.284	0.093	0.059	0.078	1.061	0.910–1.238	0.450
Toughness		0.140	0.068	1.150	1.007–1.313	0.039	0.151	0.081	1.163	0.992–1.363	0.063
Self-confidence		−0.161	0.058	0.851	0.759–0.954	0.006	−0.074	0.067	0.928	0.814–1.058	0.266

SE, standard error; OR, odds ratio; CI, confidence interval; B, regression coefficient; p, p value; PES, Practice Environment Scale: A one-unit decrease in the PES score was associated with an odds ratio of 1.033(95% CI: [1.018–1.049]) for nursing care omissions, indicating a 3.3% increase in the likelihood of missed care per unit reduction in the practice environment quality, adjusted for covariates in the model; Sense of Responsibility: A one-unit decrease in the Sense of Responsibility score was associated with an odds ratio of 1.061 (95% CI: [0.910–1.238]) for nursing care omissions, indicating a 6.1% increase in the likelihood of missed care per unit reduction in responsibility levels, adjusted for covariates in the model; Toughness: A one-unit decrease in the Toughness score was associated with an odds ratio of 1.163 (95% CI: [0.992–1.363]) for nursing care omissions, indicating a 16.3% increase in the likelihood of missed care per unit reduction in toughness levels, adjusted for covariates in the model; Profile 2, medium-risk missed nursing care profile; Profile 3, low-risk missed nursing care profile; * comparison group

comprehensive assessments of patients' conditions during the execution of basic nursing tasks.

Demographic and missed nursing care -related characteristics of each profile

Demographic predictors of profile membership include age, education, and job satisfaction. Compared to the 'severe missed nursing care profile,' younger neuro-oncology nurses (18–35 years) are more likely to belong to the 'middle-risk missed nursing care profile,' which contrasts with previous research findings [23]. While this contrast warrants careful interpretation, we propose that younger nurses' heightened technological proficiency may partially explain this result. With the healthcare industry's rapid digital transformation, electronic reminder systems and AI-driven workflows have become critical tools for mitigating MNC [31]. Younger nurses, often characterized as 'digital natives,' typically demonstrate greater familiarity with electronic health records and clinical decision-support systems, enabling more efficient task prioritization and documentation [32, 33]. For instance, a recent study found that nurses under 35 years old committed 28% fewer documentation errors when using Electronic Health Record(EHR)alerts compared to senior colleagues [31]. Furthermore, nursing managers in neuro-oncology units increasingly leverage technology-focused empowerment strategies, such as real-time workload dashboards and mobile task-tracking apps, which align with younger nurses' technological competencies [34, 35]. This generational advantage in navigating digital workflows may offset the experience gap, reducing MNC risks despite shorter tenure. However, we acknowledge the need for longitudinal studies to disentangle age-related effects from institutional training quality and workplace digital maturity. To strengthen these findings, future research should explicitly measure technological literacy across age groups and its interaction with MNC patterns, particularly in high-acuity specialties like neuro-oncology where time-sensitive interventions are critical.

Additionally, neuro-oncology nurses with technical secondary school or junior college education are more likely to fall into the "middle-risk missed nursing care profile" compared with those in the 'severe missed nursing care profile,' a finding that contradicts earlier studies [23, 36, 37]. Nurses from secondary and junior colleges typically enter the workforce earlier than undergraduates, resulting in greater clinical proficiency and competence, which may reduce MNC occurrences. This could also relate to their higher professional titles and reduced

exposure to clinical practices, leading to fewer reported instances of MNC. Nursing managers should strategically assign nursing roles and delineate responsibilities, ensuring a balanced mix of nurses across different ages and educational backgrounds to alleviate excess workload. Further research is warranted to clarify the relationship between age, education, and MNC.

In comparison to the "severe missed nursing care profile," neuro-oncology nurses who express job satisfaction are more likely to fall into the "middle-risk missed nursing care profile," aligning with the majority of existing studies [38–40]. A positive professional outlook and a strong professional identity are essential for the sustainable development of nursing careers [41, 42]. In clinical management, opportunities for training and promotion can enhance nursing practice. Fostering a sense of teamwork can increase job satisfaction and reinforce the professional identity of nursing staff.

MNC is influenced by various predictors, including psychological empowerment (PES), self-confidence, and resilience. The nursing work environment significantly predicts both the "middle-risk missed nursing care profile" and the "low-risk missed nursing care profile." The nursing work environment encompasses nurse participation in hospital affairs, high-quality nursing services, the abilities and leadership styles of nursing managers, availability of human and material resources, and collaboration between medical and nursing staff. It has been established that adequate manpower and material resources serve as protective factors against MNC [43]. However, only 9% of nurses believe that the nurse-patient ratio is sufficient [6]. Lake [12] has indicated that for every new patient admitted to a ward, the probability of nursing loss increases by 70%. A lack of essential departmental resources can lead to decreased nursing efficiency and may delay or even result in missed nursing needs [14]. Consequently, it is recommended that neuro-oncology nursing managers allocate human resources effectively, enhance the replenishment of supplies and equipment, and ensure appropriate drug placement within the department to uphold patient care quality.

Prior research suggests that effective team communication, a positive working atmosphere, and the integration of medical care can significantly reduce the incidence of MNC [44]. Specifically, a one-point increase in interpersonal relationships correlates with a 21.9% decrease in nursing loss probability [24]. Studies have shown that reinforcing team cooperation during nursing staff training significantly reduces MNC rates [45]. Therefore, it is essential for neuro-oncology medical staff to foster mutual understanding and respect, actively promoting collaborative models such as integrated medical-nursing rounds and joint decision-making to enhance work efficiency and improve patient outcomes [46]. Implementing effective strategies by nursing managers can boost neuro-oncology nurses' work enthusiasm and professional identity, leading to higher job satisfaction and more proactive engagement in nursing activities [11]. It is advisable for neuro-oncology nursing managers to leverage effective strategies, informed by Maslow's hierarchy of needs theory [47], to provide humanistic care and recognize outstanding nurses. This approach can fulfill nurses' needs for growth and development while enhancing overall nursing quality from the perspectives of physiological, emotional, and self-actualization needs. Chapman [39] noted that patient care accounts for only 37% of nurses' daily workload. Park [11] further highlighted that an increase of one point in nurse participation in hospital affairs raises the likelihood of nursing loss by 2.1 times. Excessive involvement in hospital affairs can lead to increased workload and burnout, subsequently reducing direct patient care time [11]. Thus, the frequency of neuro-oncology nurses' participation in hospital affairs should be adjusted based on actual clinical needs.

Our research demonstrates that neuro-oncology nurses with strong self-confidence and mental resilience can reduce the likelihood of MNC. A previous study [48] indicated that self-confidence and mental toughness can mitigate job burnout and enhance intrinsic motivation, thereby improving nursing quality and fostering personal and departmental development. Kim [49] suggested that compassion-centered mindfulness interventions can alleviate psychological stress among nurses. Consequently, efforts should focus on enhancing self-confidence and mental resilience in neuro-oncology nurses, providing psychological support to improve nursing quality and reduce MNC.

Practical implications

To address the predominant medium-risk missed nursing care profile (51.3% of neuro-oncology nurses), nursing managers should implement the following integrated strategies targeting work environment optimization, psychological capital enhancement, and specialized clinical workflows. Nursing managers should prioritize the deployment of AI-driven staffing systems that dynamically match nurses to patients based on real-time acuity scores (e.g., tumor grade, chemotherapy phase, and neurological deficits) and nurse competency matrices (experience, psychological resilience, certifications) [12, 14]. coupled with predictive risk alerts in electronic health records to flag high-risk tasks such as delayed intracranial pressure monitoring or antiepileptic drug administration. Concurrently, VR-based resilience training programs simulating high-stress scenarios (e.g., managing status epilepticus while addressing family concerns) should be implemented to enhance prefrontal cortex regulation under amygdala activation, complemented

by a "Resilience Bank" mobile platform where nurses earn redeemable credits for task completion (e.g., chemotherapy safety checks), fostering psychological capital through mentorship and professional development opportunities [47, 48].

Clinical workflows must be restructured to include time-sensitive care bundles, such as automated 15-minute neurological assessments (e.g., smart device-enabled pupillary response checks) during the postoperative 24-hour period and synchronized evaluations of headache-vomiting-delirium triads using wearable intracranial pressure (ICP) monitors and family-assisted symptom logs. Introducing Neuro-TIME shift handovers—emphasizing Tumor-specific risks, Intracranial pressure trends, Medication safety, and Emergency preparedness—ensures continuity in high-stakes care. Real-time feedback mechanisms, including individualized MNC heatmaps highlighting task omission patterns (e.g., delays in chemotherapy premedication) and biweekly root-cause analysis (RCA) sessions for near-miss events, further reinforce accountability. To ensure sustainability, successful strategies must be embedded into hospital accreditation standards and annual competency assessments, creating a scalable model for high-acuity specialties [50]. These evidence-based interventions, validated in preliminary trials, reduce task omissions by 22–38% while improving nurse retention, ultimately enhancing care quality for neuro-oncology patients [31–35].

While our findings provide critical insights into missed nursing care patterns in Chinese neuro-oncology units, their generalizability to other healthcare systems requires cautious consideration. Contextual factors such as nurse-patient ratios, electronic health record adoption levels, and cultural norms regarding family involvement in care may substantially influence these relationships. For instance, in countries with mandated minimum staffing laws (e.g., California, USA) [32], the impact of workload on missed care might differ from our observed patterns. Conversely, technology-driven interventions like AI staffing algorithms and VR resilience training may demonstrate broader applicability in settings with comparable digital infrastructure. Future cross-cultural studies should validate these associations while accounting for national variations in oncology nursing competencies and healthcare financing models.

Limitations

This study had several limitations. First, participants were randomly selected from ten Grade A tertiary oncology hospitals, which may constrain the generalizability of findings to non-tertiary or non-oncology healthcare settings. Future studies should adopt stratified sampling methods-incorporating diverse hospital tiers (e.g., secondary/primary hospitals) and geographic regions-to enhance representativeness and external validity. Second, the predominance of female nurses among participants may introduce inherent gender bias that cannot be fully addressed. Future studies should strive to include a larger proportion of male nurses for a more balanced representation. Lastly, this study utilized only quantitative research methods; integrating qualitative approaches in future investigations would provide a more comprehensive understanding of the issues at hand. Additionally, this study demonstrates significant associations between nursing work environment factors, psychological capital levels, and patterns of missed nursing care, the cross-sectional design fundamentally limits causal interpretations, as the temporal sequence and potential bidirectional relationships among these variables cannot be ascertained. Therefore, future research should include qualitative and intervention studies to further explore the influencing factors of nursing deficiencies among neuro-oncology nurses.

Conclusions

This study identified an incidence rate of 36.4% for missed nursing care (MNC) among neuro-oncology nurses. Three latent profiles were established, along with their influencing factors. Our findings indicated that neuro-oncology nurses who were aged 18–35 years, educated at the technical secondary school or junior college level, satisfied with their positions, exhibited strong self-confidence and mental resilience, and worked in supportive nursing environments were predictive of specific latent profile categories regarding MNC. Nursing managers should prioritize addressing middle-risk MNC by enhancing the working environment and providing psychological support tailored to the distribution characteristics of these profiles. This approach aims to improve nursing quality, increase job satisfaction, and enhance patient outcomes.

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Author contributions

Zhou Zhihuan and Li Ying contributed to the conception and design of the study. Zou Daili, Su Yangmei, Duan Yuyu, Xiang Qing, and Li Ying undertook material preparation, data collection, and analysis. The initial manuscript draft was composed by Li Ying, while Zhou Zhihuan provided feedback on prior versions. All authors reviewed and endorsed the final manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval
The study was approved by the Medical Ethics Committee of Sun Yat-sen University Cancer Center, Guang Zhou, China (No: SL-B2022-416-02). We certify that the study was performed in accordance with the 1964 declaration of HELSINKI and later amendments. This study strictly follows the principle of informed consent of research subjects. explain the purpose, significance, benefits and risks of the study in detail to the subjects, informed of the principle of voluntariness and confidentiality, Study is conducted after subject consent is obtained and informed consent is signed.

Consent for publication
Not applicable.

Clinical trial number
Not applicable.

Competing interests
The authors declare no competing interests.

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References
1. Li X, Cao H, Liu Y. Genetic epidemiology and risk factors for brain tumors. Zhong Nan Da Xue Xue Bao Yi Xue Ban. 2018 Apr;43:345–353.
2. Longhini J, Papastavrou E, Efstathiou G, Andreou P, Stemmer R, Ströhm C, Schubert M, de Wolf-Linder S, Palese A. Strategies to prevent missed nursing care: an international qualitative study based upon a positive deviance approach. J Nurs Manag. 2021;29:572–83.
3. Kalisch BJ, Landstrom GL, Hinshaw AS. Missed nursing care: A concept analysis. J Adv Nurs. 2009;65:1509–17.
4. Ball JE, Bruyneel L, Aiken LH, Sermeus W, Sloane DM, Rafferty AM, Lindqvist R, Tishelman C, Griffiths P, RN, RN4Cast Consortium. Post-operative mortality, missed care and nurse staffing in nine countries: A cross-sectional study. Int J Nurs Stud. 2018;78:10–5.
5. Kalánková D, Kirwan M, Bartoníčková D, Cubelo F, Žiaková K, Kurucová R. November) missed, rationed or unfinished nursing care: A scoping review of patient outcomes. J Nurs Manag. 2020;28:1783–97.
6. Cho SH, Lee JY, You SJ, Song KJ, Hong KJ. Nurse staffing, nurses prioritization, missed care, quality of nursing care, and nurse outcomes. Int J Nurs Pract. 2020;26:e12803.
7. Cho E, Lee NJ, Kim EY, Kim S, Lee K, Park KO, Sung YH. Nurse staffing level and overtime associated with patient safety, quality of care, and care left undone in hospitals: A cross-sectional study. Int J Nurs Stud. 2016;60:263–71.
8. Jones TL, Hamilton P, Murry N. Unfinished nursing care, missed care, and implicitly rationed care: state of the science review. Int J Nurs Stud. 2015;52:1121–37.
9. Haftu M, Girmay A, Gebremeskel M, Aregawi G, Gebregziabher D, Robles C. Commonly missed nursing cares in the obstetrics and gynecologic wards of Tigray general hospitals; Northern Ethiopia. PLoS One. 2019;14:e0225814.
10. Kalisch BJ, Xie B. Errors of omission: missed nursing care. West J Nurs Res. 2014;36:875–90.
11. Park SH, Hanchett M, Ma C. November) practice environment characteristics associated with missed nursing care. J Nurs Scholarsh. 2018;50:722–30.
12. Lake ET, Riman KA, Sloane DM. Improved work environments and staffing lead to less missed nursing care: A panel study. J Nurs Manag. 2020;28:2157–65.
13. Kim KJ, Yoo MS, Seo EJ. Exploring the influence of nursing work environment and patient safety culture on missed nursing care in Korea. Asian Nurs Res (Korean Soc Nurs Sci). 2018 Apr;S1976-1317(17)30683-7.
14. Smith JG, Morin KH, Wallace LE, Lake ET. Association of the nurse work environment, collective efficacy, and missed care. West J Nurs Res. 2018;40:779–98.
15. Chen YC, Li TC, Chang YW, Liao HC, Huang HM, Huang LC. Exploring the relationships among professional quality of life, personal quality of life and resignation in the nursing profession. J Adv Nurs. 2021;77:2689–99.
16. Ackerhans S, Huynh T, Kaiser C, Schultz C. Exploring the role of professional identity in the implementation of clinical decision support systems-a narrative review. Implement Sci. 2024 Feb;19:11.
17. Ren Z, Zhang X, Li X, He M, Shi H, Zhao H, Zha S, Qiao S, Li Y, Pu Y, Fan X, Guo X, Sun Y, Liu H. Relationships of organisational justice, psychological capital and professional identity with job burnout among Chinese nurses: A cross-sectional study. J Clin Nurs. 2021;30:2912–23.
18. Liu Y, Han Y, Xiong L, Ma Q, Mei L, Chong MC, Che CC. The mediating role of psychological capital in the relationship between job stress and professional identity in Chinese medical interns. Work. 2023;76:1597–604.
19. Creswell KG, Cheng Y, Levine MD. A test of the stress-buffering model of social support in smoking cessation: is the relationship between social support and time to relapse mediated by reduced withdrawal symptoms? Nicotine Tob Res. 2015;17:566–71.
20. Yin Y, Lyu M, Zuo M, Yao S, Li H, Li J, Zhang J, Zhang J. Subtypes of work engagement in frontline supporting nurses during COVID-19 pandemic: A latent profile analysis. J Adv Nurs. 2022;78:4071–81.
21. Ding CS. Fundamentals of applied multidimensional scaling for educational and psychological research. New York: Springer; 2018.
22. Meyer JP, Morin AJS. A person-centered approach to commitment research: theory, research, and methodology. J Organ Behav. 2016;37:584–612.
23. Liu DY, Gao WH, Li XK, et al. Development and psychometric test of oncology missed nursing care self-rating scale. Cancer Res Clin. 2019;31:837–41.
24. Lake ET. Development of the practice environment scale of the nursing work index. Res Nurs Health. 2002;25:176–88.
25. Yuan ZQ, Wang JL, Jin M, et al. Development and reliability and validity of a psychological capital scale for nurses. Nurs J Chin PLA. 2023;58:74–80.
26. Lo Y, Mendell NR, Rubin DB. Testing the number of components in a normal mixture. Biometrika. 2001;88:767–78.
27. Zeleníková R, Drach-Zahavy A, Gurková E, Papastavrou E, RANCARE Consortium COST COST. November) Understanding the concept of missed nursing care from a cross-cultural perspective. J Adv Nurs. 2019;75:2995–3005.
28. Boyle DA. Occupational stress in oncology nurse caregiving: caring for ourselves. Clin J Oncol Nurs. 2015;19:499.
29. Soheili M, Taleghani F, Jokar F, Eghbali-Babadi M, Sharifi M. November) occupational stressors in oncology nurses: A qualitative descriptive study. J Clin Nurs. 2021;30:3171–81.
30. Zaghini F, Biagioli V, Proietti M, Badolamenti S, Fiorini J, Sili A. The role of occupational stress in the association between emotional labor and burnout in nurses: A cross-sectional study. Appl Nurs Res. 2020;54:151277.
31. Piscotty RJ Jr, Kalisch B. The relationship between electronic nursing care reminders and missed nursing care. Comput Inf Nurs. 2014;32:475–81.
32. Piscotty RJ, Kalisch B, Gracey-Thomas A. May) Yarandi H. Electronic nursing care reminders: implications for nursing leaders. J Nurs Adm. 2015;45(5):239–42.
33. Piscotty RJ Jr, Kalisch B, Gracey-Thomas A. July) impact of healthcare information technology on nursing practice. J Nurs Scholarsh. 2015;47(4):287–93.
34. Galiano MA, Moreno Fergusson ME, Guerrero WJ et al. (2024 April) Technological innovation for workload allocation in nursing care management: an integrative review. 2024 Apr F1000Res 26;12:104.
35. Mohammadnejad F, Freeman S, Klassen-Ross T, et al. June) impacts of technology use on the workload of registered nurses: A scoping review. J Rehabil Assist Technol Eng. 2023;17:10:20556683231180189.
36. Eskin Bacaksiz F, Alan H, Taskiran Eskici G, Gumus E. A cross-sectional study of the determinants of missed nursing care in the private sector: hospital/unit/staff characteristics, professional quality of life and work alienation. J Nurs Manag. 2020;28:1975–85.
37. Kalisch BJ, Tschannen D, Lee H, Friese CR. July-August) hospital variation in missed nursing care. Am J Med Qual. 2011;26:291–9.
38. Kalisch BJ, Doumit M, Lee KH, Zein JE. Missed nursing care, level of staffing, and job satisfaction: Lebanon versus the united States. J Nurs Adm. 2013;43:274–9.

39. Chapman R, Rahman A, Courtney M, Chalmers C. Impact of teamwork on missed care in four Australian hospitals. J Clin Nurs. 2017;26:170–81.
40. White EM, Aiken LH, McHugh MD. Registered nurse burnout, job dissatisfaction, and missed care in nursing homes. J Am Geriatr Soc. 2019;67:2065–71.
41. White EM, Aiken LH, Sloane DM, McHugh MD. March-April) nursing home work environment, care quality, registered nurse burnout and job dissatisfaction. Geriatr Nurs. 2020;41:158–64.
42. Bakker AB. Job crafting among health care professionals: the role of work engagement. J Nurs Manag. 2018;26:321–31.
43. Hessels AJ, Flynn L, Cimiotti JP, Cadmus E, Gershon RRM. The impact of the nursing practice environment on missed nursing care. Clin Nurs Stud. 2015;3:60–5.
44. Zhao Y, Su J, Ma D, Li H, Li Y, Zhang X, Li Z, Sun J. The role of teamwork in the implicit rationing of nursing care: A systematic mixed-methods review. J Nurs Manag. 2021;29:890–904.
45. Kalisch BJ, Xie B, Ronis DL. November-December) Train-the-trainer intervention to increase nursing teamwork and decrease missed nursing care in acute care patient units. Nurs Res. 2013;62:405–13.
46. Schubert M, Ausserhofer D, Bragadóttir H, Rochefort CM, Bruyneel L, Stemmer R, Andreou P, Leppée M, Palese A, RANCARE Consortium COST Action - CA 15208 COST. Interventions to prevent or reduce rationing or missed nursing care: A scoping review. J Adv Nurs. 2021;77:550–64.
47. Kim HJ, Shin SH. December) [Development and validation of the nurse needs satisfaction scale based on Maslow's hierarchy of needs theory]. J Korean Acad Nurs. 2020;50:848–62. Korean.
48. Broad JD, Luthans F. November-December) positive resources for psychiatry in the fourth industrial revolution: Building patient and family focused psychological capital (PsyCap). Int Rev Psychiatry. 2020;32:542–54.
49. Kim C, Lee Y. Effects of compassion competence on missed nursing care, professional quality of life and quality of life among Korean nurses. J Nurs Manag. 2020;28:2118–27.
50. Blake N, Joslin HJ, Joslin D, Sangalang R. Enhancing nurse satisfaction and retention through Real-Time feedback: A case study at Los Angeles general medical center. Nurse Lead. 2024;22(5):549–5.

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