Professional Self-Concept and Burnout among Hepatobiliary Surgery Nurses: A Cross-Sectional Study Based on the JD-R Model

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ABSTRACT

Based on the Job Demands–Resources (JD-R) model and Professional Self-Concept Theory, this study examined the relationships among professional self-concept, job demands and emotional exhaustion among hepatobiliary surgery nurses in the context of enhanced recovery after surgery (ERAS), and identified the key dimensions with stronger protective effects. From May to August 2025, a convenience sample of 326 practising hepatobiliary surgery nurses was recruited from three tertiary hospitals in Guangzhou. Data were collected using a demographic questionnaire, the Job Demands Scale, the Professional Self-Concept Scale for Nurses (PSCS), and the Maslach Burnout Inventory–General Survey (MBI-GS). Descriptive statistics, correlation analysis and hierarchical multiple regression analysis were conducted. The mean score for emotional exhaustion was 3.12 ± 1.07, with 88.7% of nurses scoring ⩾2.0. Total professional self-concept was significantly negatively correlated with emotional exhaustion ($r = -0.546$), whereas job demands were significantly positively correlated with emotional exhaustion ($r = 0.411$). After controlling for demographic and occupational characteristics, the final hierarchical regression model explained 36.2% of the variance in emotional exhaustion ($R^2 = 0.362$). Job demands had a significant positive predictive effect on emotional exhaustion ($\beta = 0.221$), whereas skill competence ($\beta = -0.275$) and leadership ($\beta = -0.144$) were independently associated with lower emotional exhaustion, with skill competence showing the strongest effect. Hepatobiliary surgery nurses experience relatively high levels of emotional exhaustion. Job demands represent an important risk factor, whereas skill competence and leadership function as protective factors, with skill competence being particularly important. Nurse managers should optimise job demands while strengthening nurses' professional resources through structured specialty training and competency development.

1. Introduction

According to data from GLOBOCAN 2020, liver cancer is the sixth most common cancer and the third leading cause of cancer-related mortality world - wide, with China bearing a substantial proportion of the global liver cancer burden (Sung et al., 2021). With the development of minimally invasive hepate - ctomy, robot-assisted techniques and the enhanced recovery after surgery (ERAS) approach, hepatobiliary surgical nursing has placed increasingly higher demands on nurses' professional judgement, technical competence and ca - pacity for continuous learning (Jin et al., 2021). Previous studies have indicated that perioperative nursing in hepatobiliary surgery involves complex clinical monitoring, the identification of risks associated with postoperative complica - tions and high work intensity, all of which may increase nurses' job demands (Yu et al., 2015; Müller et al., 2021).

Against this background, hepatobiliary surgery nurses commonly experi - ence high job demands. Studies have shown that nurses in this specialty fre - quently encounter distinctive stressors, including intensive perioperative sur - gical support, high monitoring risks associated with postoperative complica - tions such as bile leakage and bleeding, and rapid patient turnover (Akbuğa & Yılmaz, 2025). According to the Job Demands–Resources (JD-R) model, persis - tently high job demands consume individuals' physical and psychological res-

ources and increase the risk of burnout; meanwhile (Li & Shi 2003), personal resources can help individuals cope with job demands and maintain positive work functioning (Bakker & Demerouti, 2017; Zheng, 2026). Burnout not only threatens nurses' physical and psychological well-being but is also closely associated with increased rates of nursing errors and lower patient satisfaction (Lesener et al., 2019). However, the JD-R model also proposes that personal resources, such as self-efficacy, optimism and professional competence, can buffer the adverse effects of high job demands (Harari et al., 2023).

Professional self-concept, defined as an individual's overall perception of their professional role, competence and value, is considered an important personal resource among nurses (Cowin & Hengstberger-Sims, 2006). Based on Professional Self-Concept Theory (PSCT), a positive professional self-concept can help individuals maintain psychological stability when facing professional challenges and promote adaptive coping. Positive professional self-evaluation contributes to maintaining stability in one's professional role and facilitates adaptive coping (Arthur, 1995). Previous studies have demonstrated a close association between professional self-concept and nurses' burnout, while recent research has further emphasised the multidimensional nature of professional self-concept, suggesting that its different dimensions may exert different effects (Arthur, 1995; Peng et al., 2012).

Existing research on nurses' burnout has primarily focused on high-pressure nursing settings, such as oncology, emergency and intensive care, whereas relatively limited attention has been paid to hepatobiliary surgery nurses (Marzocchi et al., 2024). Professional self-concept is a multidimensional construct comprising sub-dimensions such as skill competence, career satisfaction and communication (Almeida et al., 2023; Miao et al., 2024). Therefore, this study focused on hepatobiliary surgery nurses and examined the relationships among professional self-concept, job demands and emotional exhaustion. Identifying the core dimension with the strongest protective effect is of considerable practical value for developing evidence-based and targeted nursing intervention programmes.

Based on the theoretical and empirical foundations outlined above, the following hypotheses were proposed:

H1: Professional self-concept is significantly negatively associated with nurses' emotional exhaustion.

H2: After controlling for demographic and occupational characteristics and job demands, the different dimensions of professional self-concept independently predict emotional exhaustion.

H3: Among the dimensions of professional self-concept, skill competence has the strongest negative predictive effect on emotional exhaustion.

2. Methods

2.1 Study Design

A cross-sectional survey design was adopted. The study was conducted from May to August 2025 in three tertiary general hospitals in Guangzhou, all of which had independent hepatobiliary surgery wards, including liver transplantation centres. The study was reported in accordance with the recommended standards for cross-sectional observational studies. This was an anonymous cross-sectional questionnaire survey that did not involve clinical intervention, biological sample collection or the collection of personally identifiable information. The study adhered to the ethical principles of the Declaration of Helsinki. All participants provided informed consent voluntarily after being fully informed about the study and were free to withdraw from the survey at any time.

2.2 Participants and Sampling

A convenience sampling method was employed. The inclusion criteria were as follows: (1) holding a valid nursing practising certificate; (2) having worked in a hepatobiliary surgery department for $\geqslant$1 year; (3) having directly participated in perioperative surgical assistance or postoperative monitoring within the previous three months; and (4) voluntary participation in the study. The exclus-

ion criteria were as follows: (1) nurses undertaking further training and student nurses; (2) nurses who were on leave or undertaking further training outside the hospital during the survey period; and (3) nurses with severe physical or psychiatric illnesses.

2.3 Research Instruments

2.3.1 Demographic and Occupational Characteristics Questionnaire

A self-designed questionnaire was used to collect demographic characteristics, including age, sex, educational level, professional title and marital status, as well as occupational characteristics, including years of experience in hepatobiliary nursing, number of night shifts per month, participation in liver transplantation nursing, and the number of major surgical procedures assisted per month.

2.3.2 Job Demands Scale

The Job Demands Scale was adapted based on the Job Demands–Resources (JD-R) theoretical framework proposed by Demerouti et al. (2001), with modifications made to reflect the characteristics of nursing work. A five-point Likert scale was used, ranging from 1 (never) to 5 (always), with higher scores indicating higher job demands. The Cronbach's α coefficient of the scale in the present study was 0.673.

2.3.3 Professional Self-Concept Scale for Nurses (PSCS)

Professional self-concept was assessed using the Professional Self-Concept Scale for Nurses (PSCS), based on Cowin's (2001) measurement framework for nurses' professional self-concept. The scale uses a five-point Likert response format ranging from 1 (strongly disagree) to 5 (strongly agree), with a total score ranging from 18 to 90. Higher scores indicate a more positive professional self-concept. The Cronbach's α coefficient for the overall scale was 0.838 in the present study, while those for the four dimensions were 0.667, 0.601, 0.615 and 0.713, respectively.

2.3.4 Maslach Burnout Inventory–General Survey (MBI-GS)

The Chinese version of the Maslach Burnout Inventory–General Survey (MBI-GS), revised by Li Chaoping et al. (2003), was used. The MBI-GS employs a seven-point Likert scale ranging from 0 (never) to 6 (every day). In the present study, emotional exhaustion was used as the primary outcome measure. Following previous research, an emotional exhaustion score of $\geqslant$2.0 was defined as indicating a relatively pronounced level of emotional exhaustion (Schaufeli et al., 2020). The Cronbach's α coefficients for emotional exhaustion, depersonalisation and personal accomplishment were 0.769, 0.812 and 0.892, respectively. To construct an overall burnout indicator, the personal accomplishment dimension was reverse-scored and then averaged with the emotional exhaustion and depersonalisation dimensions. Higher scores indicated a higher overall level of burnout.

2.4 Statistical Analysis

Data were analysed using SPSS version 22.0. Descriptive statistics were first performed. Continuous variables were presented as means and standard deviations (M $\pm$ SD), while categorical variables were presented as frequencies and percentages. The distributions of continuous variables were assessed using skewness and kurtosis, with absolute values <2 considered indicative of an approximately normal distribution (George, 2011).

Pearson's correlation analysis was conducted to examine the associations between the dimensions of professional self-concept and burnout. Correlation coefficients (r) of <0.40, 0.40–0.70 and >0.70 were interpreted as indicating weak, moderate and strong correlations, respectively (Cohen, 1988). Hierarchical multiple linear regression analysis was performed to examine the independent predictive effects of the dimensions of professional self-concept on emotional exhaustion. In the first step, age, professional title, years of experience in hepat-

obiliary nursing and number of night shifts were entered. Job demands were added in the second step, followed by skill competence, career satisfaction, communication and leadership in the third step. Multicollinearity was assessed, with a tolerance value >0.10 and a variance inflation factor (VIF) <10 considered indicative of no significant multicollinearity (Field, 2018). As professional title was a categorical variable, dummy coding was used in the regression analysis, with nurse as the reference category. Continuous variables were retained in their original continuous form. Unstandardised coefficients (B), standardised coefficients (β), P values, R^2 and adjusted R^2 were reported, and multicollinearity was assessed.

Differences between groups based on years of work experience, educational level, professional title and marital status were examined using one-way analysis of variance (ANOVA). For comparisons between two groups, independent-samples t-tests were conducted, and eta squared (η^2) was calculated as the effect size. Values of 0.01, 0.06 and 0.14 were interpreted as indicating small, medium and large effects, respectively (Cohen, 1992). All statistical tests were two-tailed, and $P < 0.05$ was considered statistically significant.

3. Results

3.1 Demographic Characteristics of the Participants

A total of 326 practising hepatobiliary surgery nurses were included in the study. The mean age was 31.89 ± 5.65 years (range: 22–48 years). Of the participants, 292 (89.6%) were female, and 34 (10.4%) were male. Regarding educational level, 252 (77.3%) held a bachelor's degree, 49 (15.0%) held a college diploma, and 25 (7.7%) held a master's degree or higher. Professional titles included nurse for 116 participants (35.6%), nurse practitioner for 139 (42.6%), senior nurse for 66 (20.2%), and associate senior nurse or above for 5 (1.5%). In terms of marital status, 223 participants (68.4%) were married, 94 (28.8%) were unmarried, and 9 (2.8%) were divorced or widowed. Regarding years of experience in hepatobiliary nursing, 40 participants (12.3%) had 1–3 years of experience, 40 (12.3%) had 4–6 years, and 246 (75.5%) had ⩾7 years.

3.2 Scale Scores and Distribution Characteristics

The mean score for emotional exhaustion was 3.12 ± 1.07, with a range of 0.40–5.80. A total of 289 nurses (88.7%) had an emotional exhaustion score of ⩾2.0. The mean scores for depersonalisation and personal accomplishment were 2.26 ± 1.02 and 3.63 ± 1.22, respectively. The mean score for job demands was 18.38 ± 3.37. The total professional self-concept score was 65.19 ± 9.82, with a range of 34–90. The mean scores for skill competence, career satisfaction, communication and leadership were 18.01 ± 3.46, 16.91 ± 3.30, 15.17 ± 2.83 and 15.10 ± 3.14, respectively. The absolute values of skewness and kurtosis for all continuous variables were <2, indicating approximately normal distributions (Table 1).

Table 1 Descriptive Statistics and Normality Tests for the Main Study Variables (N = 326)

Variable	M ± SD	Range	Skewness	Kurtosis
Emotional Exhaustion	3.12 ± 1.07	0.40–5.80	−0.088	−0.133
Depersonalisation	2.26 ± 1.02	0–6	0.253	0.316
Personal Accomplishment	3.63 ± 1.22	0.17–6.00	−0.119	−0.383
Burnout	7.76 ± 2.59	1.63–15.43	0.127	−0.367
Professional Self-Concept (total)	65.19 ± 9.82	34–90	−0.220	−0.160
Skill Competence	18.01 ± 3.46	9–25	−0.124	−0.249
Career Satisfaction	16.91 ± 3.30	7–25	−0.016	−0.023
Communication	15.17 ± 2.83	5–20	−0.236	−0.312
Leadership	15.10 ± 3.14	5–20	−0.318	−0.394
Job Demands	18.38 ± 3.37	8–25	−0.163	−0.299

3.3 Correlation Analysis of Professional Self-Concept and Burnout

As shown in Table 2, total professional self-concept was significantly negatively correlated with emotional exhaustion (r = −0.546, P < 0.001) and depersonalisation (r = −0.467, P < 0.001), while it was significantly positively correlated with personal accomplishment (r = 0.491, P < 0.001) and significantly negatively correlated with burnout (r = −0.641, P < 0.001). These findings indicate that higher levels of professional self-concept were associated with lower levels of emotional exhaustion and depersonalisation, higher levels of personal accomplishment, and lower overall levels of burnout among nurses.

All four dimensions of professional self-concept were significantly negatively correlated with emotional exhaustion. Skill competence showed the strongest correlation with emotional exhaustion (r = −0.511, P < 0.001), followed by career satisfaction (r = −0.402, P < 0.001), communication (r = −0.389, P < 0.001), and leadership (r = −0.374, P < 0.001). Similarly, all four dimensions were significantly negatively correlated with burnout, with skill competence showing the strongest correlation (r = −0.596, P < 0.001), followed by career satisfaction (r = −0.499, P < 0.001), communication (r = −0.438, P < 0.001), and leadership (r = −0.430, P < 0.001).

Job demands were significantly positively correlated with emotional exhaustion (r = 0.411, P < 0.001), depersonalisation (r = 0.392, P < 0.001) and burnout (r = 0.434, P < 0.001), while being significantly negatively correlated with total professional self-concept (r = −0.389, P < 0.001). These findings indicate that higher job demands were associated with higher levels of burnout, whereas higher levels of professional self-concept were associated with lower levels of burnout.

Table 2 Correlation Matrix of Professional Self-Concept, Job Demands and Emotional Exhaustion

Variable	1	2	3	4	5	6	7	8	9	10
1. EE	1									
2. DP	0.498***	1								
3. PA	−0.455***	−0.305***	1							
4. BO	0.824***	0.744***	−0.778***	1						
5. PSC	−0.546***	−0.467***	0.491***	−0.641***	1					
6. SC	−0.511***	−0.430***	0.457***	−0.596***	0.822***	1				
7. CS	−0.402***	−0.363***	0.402***	−0.499***	0.771***	0.567***	1			
8. COM	−0.389***	−0.285***	0.351***	−0.438***	0.770***	0.528***	0.419***	1		
9. LEAD	−0.374***	−0.348***	0.294***	−0.430***	0.720***	0.397***	0.360***	0.484***	1	
10. JD	0.411***	0.392***	−0.233***	0.434***	−0.389***	−0.367***	−0.261***	−0.310***	−0.259***	1

Note. EE = Emotional Exhaustion; DP = Depersonalisation; PA = Personal Accomplishment; BO = Burnout; PSC = Professional Self-Concept; SC = Skill Competence; CS = Career Satisfaction; COM = Communication; LEAD = Leadership; JD = Job Demands. *p < 0.05; **p < 0.01; ***p < 0.001.

3.4 Predictive Effects of Professional Self-Concept on Burnout

As shown in Table 3, hierarchical multiple linear regression analysis was conducted with emotional exhaustion as the dependent variable. In the first step, age, professional title, years of experience in hepatobiliary nursing and number of night shifts were entered into the model. The model yielded an R^2 of 0.021 and an adjusted R^2 of 0.003 and was not statistically significant overall (F = 1.141, P = 0.338). After job demands were added in the second step, R^2 increased to 0.183 and adjusted R^2 to 0.165, and the overall model was statistically significant (F = 10.152, P < 0.001). Job demands showed a significant positive predictive effect (B = 0.129, β = 0.406, P < 0.001). Following the addition of the four dimensions of professional self-concept in the third step, R^2 further increased to 0.362 and adjusted R^2 to 0.340, with the overall model remaining statistically significant (F = 16.192, P < 0.001).

In the final model, job demands remained a significant positive predictor of emotional exhaustion (B = 0.070, β = 0.221, P < 0.001), whereas skill competence (B = −0.085, β = −0.275, P < 0.001) and leadership (B = −0.049, β = −0.144, P = 0.008) showed significant negative predictive effects. The independent predictive effects of career satisfaction (β = −0.096, P = 0.093) and communication (β =

−0.066, P = 0.255) did not reach statistical significance. None of the professional-title dummy variables, with nurse as the reference category, reached statistical significance in the final model.

Table 3 Hierarchical Multiple Linear Regression Analysis of Emotional Exhaustion (N = 326)

Variable	Model 1		Model 2		Model 3	
	B	β	B	β	B	β
Age	-0.004	-0.021	-0.005	-0.024	-0.003	-0.013
Nurse Practitioner (vs. Nurse)	0.064	0.029	0.098	0.045	0.008	0.003
Senior Nurse (vs. Nurse)	0.198	0.074	0.167	0.063	0.105	0.039
Associate Senior Nurse or Above (vs. Nurse)	1.065	0.123	0.667	0.077	0.563	0.065
Years of Hepatobiliary Nursing Experience	0.007	0.026	0.01	0.034	0.009	0.033
Night Shifts per Month	-0.01	-0.034	-0.016	-0.056	-0.01	-0.036
SC	-	-	-	-	-0.085	-0.275***
CS	-	-	-	-	-0.031	-0.096
COM	-	-	-	-	-0.025	-0.066
LEAD	-	-	-	-	-0.049	-0.144**
JD	-	-	0.129	0.406***	0.07	0.221***
R^2	0.021		0.183		0.362	
ΔR^2	0.021		0.162		0.179	
Adjusted R^2	0.003		0.165		0.34	
F	1.141		10.152***		16.192***	
ΔF	—		62.889		22.055	

Note. SC = Skill Competence; CS = Career Satisfaction; COM = Communication; LEAD = Leadership; JD = Job Demands. Professional title was dummy-coded, with Nurse as the reference category. B = unstandardised regression coefficient; β = standardised regression coefficient; R^2 = coefficient of determination; ΔR^2 = change in R^2; ΔF = change in F statistic. *p < 0.05; **p < 0.01; ***p < 0.001.

3.5 Comparison of Emotional Exhaustion across Nurses with Different Demographic and Occupational Characteristics

No statistically significant difference was observed in emotional exhaustion scores among nurses with different years of experience in hepatobiliary nursing (F = 1.115, P = 0.329, η^2 = 0.007). The mean emotional exhaustion scores were 3.13 ± 1.07, 3.35 ± 1.10 and 3.08 ± 1.06 for nurses with 1–3, 4–6 and ⩾7 years of experience, respectively. Nurses who had and had not participated in liver transplantation nursing had mean emotional exhaustion scores of 3.25 ± 1.02 and 3.06 ± 1.09, respectively, with no statistically significant difference between the groups (t = −1.429, P = 0.154, η^2 = 0.006). Nurses working fewer than 8 and ⩾8 night shifts per month had mean emotional exhaustion scores of 3.18 ± 1.04 and 3.05 ± 1.11, respectively, with no statistically significant difference between the groups (t = −1.134, P = 0.258, η^2 = 0.004). In addition, no statistically significant differences were observed across groups based on sex, educational level, professional title or marital status (all P > 0.05).

Table 4 Comparison of Emotional Exhaustion Scores across Nurses with Different Demographic and Occupational Characteristics (N = 326)

Characteristic	Group	n	M ± SD	t/F	P	η^2
Years of Hepatobiliary Nursing Experience	1–3 years	40	3.13 ± 1.07	1.115	0.329	0.007
	4–6 years	40	3.35 ± 1.10			
	⩾7 years	246	3.08 ± 1.06			
Liver Transplantation Nursing	Yes	101	3.25 ± 1.02	1.429	0.154	0.006
	No	225	3.06 ± 1.09			
Night Shifts per Month	<8	184	3.18 ± 1.04	1.134	0.258	0.004
	⩾8	142	3.05 ± 1.11			
Sex	Female	292	3.14 ± 1.05	0.700	0.485	0.002
	Male	34	3.00 ± 1.21			
Educational Level	College diploma	49	3.22 ± 1.01	0.766	0.466	0.005
	Bachelor’s degree	252	3.08 ± 1.09			
	Master’s degree or above	25	3.31 ± 1.00			
Professional Title	Nurse	116	3.03 ± 1.06	2.045	0.107	0.019
	Nurse Practitioner	139	3.10 ± 1.05			
	Senior Nurse	66	3.25 ± 1.13			
	Associate Senior Nurse or above	5	4.12 ± 0.46			
Marital Status	Married	223	3.10 ± 1.05	0.299	0.742	0.002
	Unmarried	94	3.14 ± 1.13			
	Divorced/Widowed	9	3.38 ± 0.83			

Note: M = mean; SD = standard deviation; η^2 = eta squared. For comparisons involving two groups, t tests were used; for comparisons involving three or more groups, one-way analysis of variance (ANOVA) was used. $P < 0.05$ was considered statistically significant.

4. Discussion

4.1 Main Findings and Theoretical Interpretation

Based on the JD-R model and Professional Self-Concept Theory, this study examined the relationships among job demands, professional self-concept and emotional exhaustion among hepatobiliary surgery nurses. The findings showed that the participants generally experienced relatively high levels of emotional

exhaustion. Job demands were significantly positively correlated with emotional exhaustion, whereas professional self-concept and all four of its dimensions were significantly negatively correlated with emotional exhaustion. Further hierarchical regression analysis showed that, after controlling for age, professional title, years of experience in hepatobiliary nursing and number of night shifts, job demands remained an important positive predictor of emotional exhaustion, while skill competence and leadership showed significant negative predictive effects, with skill competence demonstrating the strongest independent association.

From the perspective of the JD-R model, job demands continuously consume individuals' physical and psychological resources, and when job demands persistently exceed available resources, individuals are more likely to experience energy depletion and burnout (Demerouti et al., 2001; Bakker & Demerouti, 2017). In the present study, job demands were moderately positively correlated with emotional exhaustion ($r = 0.411$, $P < 0.001$) and remained a significant positive predictor in the final regression model ($\beta = 0.221$, $P < 0.001$), consistent with the broader evidence from previous JD-R research (Lesener et al., 2019; Marzocchi et al., 2024).

Total professional self-concept was significantly negatively correlated with emotional exhaustion ($r = -0.546$, $P < 0.001$), suggesting that nurses who held more positive perceptions of their professional competence, role and value tended to report lower levels of emotional exhaustion. This finding is consistent with Professional Self-Concept Theory and previous research on nurses (Arthur, 1995; Cowin & Hengstberger-Sims, 2006; Goliroshan et al., 2021). However, given the cross-sectional design of the present study, this relationship should be interpreted as a protective association rather than as evidence of a causal effect or a verified "buffering effect". Molero et al. (2018) demonstrated that self-efficacy can buffer the adverse effect of workload on burnout. Nevertheless, with the rapid development of digital healthcare, nurses are increasingly exposed to technological demands. A large-scale survey by Guo et al. (2025) further showed that job insecurity and information and communication technology demands were significant predictors of nurses' burnout, suggesting that technological insecurity may amplify the adverse effects of job demands.

Overall, total professional self-concept and all four of its dimensions were significantly negatively correlated with emotional exhaustion, supporting H1. The hierarchical regression results further showed that skill competence and leadership had significant independent negative associations with emotional exhaustion, whereas career satisfaction and communication did not reach statistical significance; therefore, H2 was partially supported. As skill competence had the largest absolute standardised regression coefficient, H3 was supported.

4.2 Skill Competence as the Strongest Independent Protective Dimension

Skill competence was the most prominent finding of the present study. It was significantly negatively correlated with emotional exhaustion ($r = -0.511$, $P < 0.001$) and remained a significant negative predictor after simultaneously controlling for job demands and the other dimensions of professional self-concept ($\beta = -0.275$, $P < 0.001$). It also had the largest absolute standardised regression coefficient, supporting H3.

This finding can be interpreted in terms of self-efficacy mechanisms. Nurses with higher levels of skill competence may have greater confidence in their ability to manage complex clinical tasks and may therefore experience a stronger sense of control and adopt more problem-focused coping when faced with high job demands (Al-Majid et al., 2018; Chen et al., 2020). Bandura & Wessels (1997) social cognitive theory emphasises that self-efficacy influences how individuals appraise challenging tasks, invest effort and persist in coping with difficulties. Previous nursing research has likewise indicated an important association between self-efficacy, work-related stress and burnout (Chen et al., 2020; Molero et al., 2018).

Therefore, compared with general psychological support, tiered training, simulation-based learning and continuous competency assessment targeting core hepatobiliary surgical skills may represent a more direct approach to strengthening personal resources (Li et al., 2025). It should be emphasised that

the present study did not evaluate the effects of training interventions. Accordingly, this recommendation should be regarded as a management implication derived from the observed associations rather than as an established intervention effect.

4.3 Independent Association of Leadership and Differences across Other Dimensions

The present study further found that leadership remained independently associated with lower emotional exhaustion after controlling for other variables ($\beta = -0.144$, $P = 0.008$). This finding suggests that the protective association between professional self-concept and emotional exhaustion is not confined entirely to technical competence. Positive perceptions of one's ability to make clinical decisions, coordinate tasks and undertake team roles may be associated with a stronger sense of job control and greater capacity to access and mobilise resources.

Although career satisfaction and communication were both significantly correlated with emotional exhaustion in the bivariate analyses, their independent predictive effects did not reach statistical significance after job demands and the other dimensions of professional self-concept were simultaneously entered into the model. This suggests that the simple associations between these dimensions and emotional exhaustion may be partly influenced by the shared effects of skill competence, leadership and job demands. Therefore, the present study does not support treating all dimensions of professional self-concept as equally strong independent protective factors. Rather, the findings suggest that skill competence and leadership warrant greater attention in future research. H2 was therefore partially supported: skill competence and leadership showed significant independent associations with emotional exhaustion, whereas the independent associations of career satisfaction and communication did not reach statistical significance.

4.4 Findings Regarding Years of Experience, Liver Transplantation Nursing and Night Shifts

According to Kramer's (1975) Reality Shock Theory, newly qualified nurses typically undergo four stages of occupational adjustment: the honeymoon phase, shock phase, recovery phase and resolution phase. Nurses with 1–3 years of experience may still be in the honeymoon phase and the early stages of organisational socialisation, during which professional novelty and social support may be relatively sufficient (Wang et al., 2026), potentially contributing to lower levels of emotional exhaustion. Nurses with 4–6 years of experience have generally become proficient in routine clinical skills and may serve as key technical staff within their departments, while simultaneously facing promotion constraints, a plateau in professional development and a growing discrepancy between increasing career expectations and actual achievements, potentially leading to a state of career plateau (Arzani et al., 2025). During this stage, the accumulation of multiple social roles may further increase the depletion of psychological resources (Müller et al., 2021).

However, the present study found no statistically significant differences in emotional exhaustion among nurses with different years of experience in hepatobiliary nursing ($F = 1.115$, $P = 0.329$, $\eta^2 = 0.007$). Although the mean emotional exhaustion score was descriptively slightly higher among nurses with 4–6 years of experience than among those with 1–3 or ⩾7 years of experience, the difference did not reach statistical significance. Therefore, the findings do not support an inference of stage-specific differences in emotional exhaustion according to years of experience. Previous research has suggested that the relationship between nurses' years of experience and burnout may be non-linear (Liao et al., 2024), while Wang et al. (2026) also reported age- and experience-related patterns of burnout. As the present study categorised years of experience for between-group comparisons, it may not have adequately captured potential non-linear patterns between continuous years of experience and emotional exhaustion. Future studies with larger samples could treat years of experience as a continuous variable and employ methods such as restricted cubic splines to further examine potential non-linear associations.

The present study also found no significant difference in emotional exhaustion between nurses who participated in liver transplantation nursing and those who did not (P = 0.154), nor did nurses working ⩾8 night shifts per month show significantly higher levels of emotional exhaustion (P = 0.258). These findings do not imply that liver transplantation nursing or night-shift work has no impact on nurses' psychological well-being. Rather, they indicate that, within the present sample and under the operational definitions used in this study, no statistically significant between-group differences were observed.

4.5 Clinical and Management Implications

Based on the JD-R model and Professional Self-Concept Theory (PSCT), the present study has the following implications for hepatobiliary surgery nursing management.

First, job demands should be optimised at the level of the work system. As job demands remained a significant positive predictor in the final model, nurse managers should pay particular attention to staffing, workflow, technological updates and task allocation during ERAS implementation, with the aim of reducing avoidable time pressure and repetitive workloads (Chen et al., 2020).

Second, structured specialty competency development should be strengthened. As skill competence was the strongest independent protective dimension identified in this study, tiered training, scenario-based simulation, case-based debriefing and continuous competency assessment could be established around core hepatobiliary nursing skills to enhance nurses' sense of professional control when managing complex clinical tasks (Cheng et al., 2026).

Third, opportunities for nurses to participate in professional roles should be expanded. Given the independent negative association between leadership and emotional exhaustion, opportunities for nurses to participate in clinical mentoring, quality improvement projects, specialty nursing teams and workflow optimisation could be increased to facilitate their involvement in decision-making and team coordination.

4.6 Limitations and Directions for Future Research

Several limitations should be acknowledged. First, the cross-sectional design precludes the establishment of causal relationships, and all data were collected through self-reported questionnaires, which may have been subject to common method bias. Future research should employ longitudinal designs and multi-source data to validate the observed associations. Second, the internal consistency coefficients of the Job Demands Scale and some sub-dimensions of professional self-concept were below the conventional threshold of 0.70. This may reflect limitations in the applicability of these measures to the specific hepatobiliary surgery context. Future studies should further examine their reliability and validity or develop specialty-specific items. Third, the final model explained 36.2% of the variance in emotional exhaustion, suggesting that other potential variables, such as organisational support and work–family conflict, were not included. In addition, the present study focused on emotional exhaustion and did not establish a structural equation model encompassing the overall structure of burnout. Fourth, the use of convenience sampling and a sample recruited from tertiary hospitals in a single city limits the generalisability of the findings. Future studies should employ multicentre designs to further validate the results.

5. Conclusion

This study showed that emotional exhaustion among hepatobiliary surgery nurses warrants attention. Job demands were significantly positively associated with emotional exhaustion and remained significantly positively associated after controlling for age, professional title, years of experience in hepatobiliary nursing and number of night shifts, as well as after simultaneously entering the dimensions of professional self-concept into the model. All four dimensions of professional self-concept were significantly negatively correlated with emotional exhaustion, while skill competence and leadership showed significant independent negative associations in the multivariable model. Skill competence also

had the largest absolute standardised regression coefficient.

The findings suggest that burnout management among hepatobiliary surgery nurses should address both job demands and personal resources. On the one hand, workflows and staffing arrangements should be optimised to reduce unnecessary job demands; on the other hand, structured specialty competency development and professional role development may strengthen nurses' skill competence and leadership. Given the cross-sectional design of the present study, these findings should be interpreted as evidence of associations rather than causal relationships. Longitudinal and intervention studies are needed to further examine the underlying mechanisms and the effectiveness of corresponding management strategies.

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