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A multi-site cross-sectional study of work-related flow and affective domain in dialysis nurses

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Work-related flow and affective domain play a pivotal role in the work efficiency and job satisfaction of dialysis nurses. This study aimed to identify the key factors influencing dialysis nurses' work-related flow and affective domain, as well as to examine the correlation between these variables. A multi-site cross-sectional study design was employed in this research. A total of 502 dialysis nurses from 14 blood purification centers in Fujian Province, China, were surveyed between November 2022 and January 2023. Valid responses were obtained from 460 nurses, with their affective domain assessed using the Affective Domain Scale and work-related flow evaluated using the Work-Related Flow Inventory. Statistical analyses, including descriptive analysis, analysis of variance, t-tests, and correlation analysis, were performed using IBM SPSS Statistics 26.0. The total score for affective domain among the 460 dialysis nurses was 112.42 ± 20.69, with an average score of 4.50 ± 0.83 per item. The total score for work-related flow was 49.55 ± 12.36, with an average score of 3.81 ± 0.95 per item. Significant differences in work-related flow scores were observed with respect to age ($P = 0.022$), hospital level ($P = 0.002$), years of experience in blood purification ($P = 0.008$), and income ($P = 0.006$). Significant differences in affective domain scores were found for age ($P = 0.001$), hospital level ($P < 0.001$), number of dialysis machines ($P = 0.039$), number of nurses ($P = 0.042$), method of employment ($P = 0.019$), professional title ($P = 0.007$), functional role ($P = 0.039$), and income ($P < 0.001$). Pearson correlation analysis revealed a positive correlation between the total scores for work-related flow and affective domain among dialysis nurses ($r = 0.660$, $P < 0.01$). Dialysis nurses demonstrated a moderate level of work-related flow and a relatively high level of affective domain. Higher affective domain scores were associated with more robust work-related flow. Therefore, improving the affective domain of dialysis nurses may enhance their work engagement.

Keywords Nurses, Dialysis, Work-related flow, Affective domain

Chronic kidney disease is a severe and increasingly prevalent non-communicable disease, with a rising global incidence. Dialysis, a primary treatment modality, is essential for over 80% of patients with kidney failure, necessitating a growing number of skilled dialysis nurses. However, dialysis units are currently experiencing a critical shortage of nursing staff. Research indicates that, in the majority of dialysis centers, nurses are responsible for administering dialysis to multiple patients per shift, a practice that exceeds the recommended guidelines[1]. Furthermore, nurses are tasked with providing comprehensive care to vulnerable, clinically complex dialysis patients, with heavy workloads and extended working hours contributing to elevated job stress[2]. Additionally, they are frequently exposed to various occupational hazards, including chemical disinfectants, machine alarms signaling emergencies or malfunctions, and direct contact with patients' bodily fluids[3]. These multifaceted challenges may lead to increased job burnout among dialysis nurses and a reduced willingness to remain in their roles[4]. These challenges underscore the urgent need to enhance nurses' work environment and emotional well-being to sustain high-quality patient care[5]. Recent studies highlight psychological interventions improving dialysis patients' physical and emotional health, which may indirectly influence nurses' work-related flow and emotional engagement. For instance, Sadeghi et al.[6,7] showed that acceptance and commitment therapy enhances clinical symptoms, treatment adherence, and pain control in dialysis patients, potentially reflecting the emotional challenges nurses face in high-stress settings[8,9]. Similarly, Torbati et al.[10] demonstrated that psychoeducational interventions reduce patients' depression and anxiety, emphasizing the psychological burden

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on healthcare providers in comparable high-pressure contexts[11]. These findings highlight the critical interplay between patients' and nurses' emotional states, directly affecting care delivery efficacy and job satisfaction.

Flow, as defined by Csikszentmihalyi[12], is "the holistic sensation that people feel when they act with total involvement." It has been linked to key job outcomes, including improved performance[10], reduced exhaustion[13], and heightened engagement[14]. Work-related flow can be described as an optimal experience within an individual's work routine. It integrates three core elements: absorption, work enjoyment, and intrinsic work motivation[15]. Absorption refers to a state in which an individual is deeply immersed in their work, concentrating fully on the current task; work enjoyment involves the cognitive and emotional evaluation of this immersive state, leading to a sense of satisfaction with the work; intrinsic work motivation is the internal sense of joy and fulfillment derived from the work itself, which motivates the individual to maintain interest and persist in exerting effort[15]. Work-related flow, characterized by a positive emotional state of deep engagement, self-forgetfulness, and enjoyment[16,17], has been shown to enhance organizational spontaneity[18], creativity[19], communication effectiveness[20], as well as engagement, performance, life satisfaction[16], and well-being[21–23]. The importance of flow experiences in the workplace, as a positive phenomenon within organizational behavior, has recently attracted growing scholarly interest. Shreffler and Huecker[22] developed a methodology to assess the flow state of physicians during their professional duties and examined the correlation between this flow and their levels of job burnout, job satisfaction, and overall well-being. Their findings indicated that enhanced flow experiences are associated with increased well-being and job satisfaction, alongside a reduction in job burnout. Martínez-Zaragoza et al.'s research[24] further suggested that fostering flow could be a strategy to improve the health outcomes of hospital ward nurses. Zito et al.[25] explored more complex dynamics, with their study investigating the mediating role of work flow in the relationship between job demands, job resources, and job burnout. Their findings indicated that job resources are essential in shaping work flow, and that work-related flow acts as a mediator in reducing job burnout, by buffering the effects of job demands. Furthermore, work flow directly impacts the reduction of job burnout. Additional studies have also examined the determinants of flow in the workplace. Previous research has shown that individual traits[26,27] and positive emotions[16,17] are also significant determinants of flow.

As defined by Krathwohl, Bloom, and Masia in 1964, the affective domain encompasses emotions, attitudes, values, and interests[28]. Russell[29] proposed that interest, attitude, belief, value, self-esteem, morality, creativity, mental health, and self-development are intricately linked to the affective domain. This domain plays a crucial role in medical students' holistic development and the sustained progress of medical education[30]. Its importance is equally evident in nursing, where the ability to apply emotions in practice is essential, including competencies in caring and emotional regulation[31]. Clive[32] emphasizes that clinical nurses and nursing students must develop competencies across three key domains: cognitive, affective, and psychomotor skills, without prioritizing any single domain. An increasing number of nursing educators and professionals are focusing on the affective domain[33,34]. For example, Guo investigated the current status and influencing factors of nurses' affective domain, exploring the relationships between nurses' affective domain, organizational support, and social support[34]. This research found that factors such as age, marital status, professional title, monthly income, and departmental affiliation influence nurses' affective domain. In contrast, Ji surveyed 600 nurses at a tertiary hospital and found that marital status did not influence nurses' affective domain[31]. Despite these findings, research on the affective domain of dialysis nurses remains limited, and the results regarding the factors influencing these domains are inconsistent, suggesting ongoing debate.

Despite the critical role of dialysis nurses in delivering life-sustaining care amidst rising chronic kidney disease prevalence, there is a significant research gap concerning the factors influencing their emotional and professional engagement. Few studies have explored the interplay between work-related flow and affective domain in this population, which are pivotal for enhancing job satisfaction, reducing burnout, and improving patient care quality. This study addresses this gap by identifying key predictors of work-related flow and affective domain among dialysis nurses and examining their interrelationship. Furthermore, it investigates how demographic factors—such as years of experience, professional title, and employment status—shape these dynamics, offering a nuanced understanding to inform targeted interventions that bolster nurse well-being and optimize care delivery.

Methods
Design
This study employed a multi-site cross-sectional design. The STROBE guidelines for reporting cross-sectional studies were followed throughout the study.

Participants and setting
The study employed a convenience sampling method to recruit dialysis nurses from 14 blood purification centers across Fujian Province, China, ensuring representation of diverse hospital settings, including varying tiers, staffing levels, and regional contexts. This approach captured real-world practices in dialysis care. Inclusion criteria for participants were: (1) possession of a valid registered nurse license, (2) at least one year of experience in dialysis nursing, and (3) no history of mental illness or consciousness disorders. Exclusion criteria included: (1) student nurses or those currently undergoing training, and (2) nurses on sick leave or maternity leave at the time of the survey.

Sample size calculation
The sample size was determined using a guideline recommending 5 to 10 times the number of independent variables, a widely accepted approach in survey-based research. With 22 independent variables (15 demographic factors, 4 affective domain dimensions, and 3 work-related flow dimensions), the target sample size was

calculated as 220 to 440 participants. To account for potential non-responses and incomplete data, the sample size was increased by 20%, yielding a minimum target of 275 participants (n = 22 × 10/(1−20%)). Additionally, the sample size was verified using the formula for finite populations:

$$n = \frac{Z^2 \times p(1-p)}{e^2}$$

where (n) is the required sample size, (Z) is the Z-score (1.96 for a 95% confidence level), (p) is the estimated proportion (0.5 for maximum variability), (e) is the margin of error (0.05), and (N) is the population size. This calculation, consistent with methodologies used in similar health-related survey studies, confirmed a minimum sample size of 275. The final sample of 460 valid responses, achieving a 91.6% response rate, ensures a robust and reliable dataset for analysis.

Instruments

Demographics questionnaire

The Demographics Questionnaire was developed specifically for this study through a systematic process to ensure its relevance and validity. Informed by a comprehensive literature review, the questionnaire encompasses 15 variables, including age, marital status, educational background, years of experience in dialysis nursing, and income, selected for their potential influence on work-related flow and affective domain. To enhance content validity, the questionnaire was reviewed by five senior dialysis nurses with extensive clinical experience, whose feedback was integrated to improve clarity and comprehensiveness. Additionally, a pilot test was conducted with a small sample of nurses to assess question clarity and respondent understanding, with subsequent refinements made prior to formal data collection. This rigorous development process ensures the questionnaire's suitability for capturing relevant demographic data in the context of this study.

To clarify the demographic variables used in this study, a distinction is made between 'professional title' and 'functional role' based on the context of the Chinese healthcare system. 'Professional title' is a nationally standardized technical rank granted by the health authorities according to the National Classification Standard for Health Professionals. It is determined by factors including professional qualifications, years of experience, and comprehensive performance evaluation. The categories include Nurse, Senior Nurse, Nurse in Charge, and Deputy Chief Nurse and above. In contrast, 'functional role' refers to the specific job position or duties assigned within the dialysis unit, primarily distinguishing between clinical responsibilities (General Duty Nurse) and administrative responsibilities (Head Nurse). This classification criterion has been explicitly included in the demographic questionnaire to ensure accurate data collection.

Nurses' affective domain evaluation scale

The Nurse Affective Domain Scale developed by Ji[31] was used in this study. The scale consists of 25 items across four dimensions: perception of professional beliefs, evaluation of professional values, comprehension of professional connotations, and internalization of professional values. Each item was assessed on a 5-point Likert scale ranging from "completely inconsistent" (1 point) to "completely consistent" (5 points). The total scores ranged from 25 to 125, with higher scores indicating a higher level of affective domain. The overall Cronbach's α coefficient for the scale was 0.976, with coefficients for each dimension being 0.897, 0.945, 0.946, and 0.910, respectively. And in this study, The overall Cronbach's α coefficient for the scale was 0.991.

Work-related flow inventory (WOLF)

The Work-Related Flow Inventory (WOLF), developed by Bakker[15], was used to measure work-related flow. The Chinese version of the WOLF was translated and validated by Zhu[35] through cross-cultural adaptation. The scale consists of 13 items across three dimensions: absorption (4 items), work enjoyment (4 items), and intrinsic work motivation (5 items). A 5-point Likert scale was employed, with 1 representing "never" and 5 representing "always." Higher total scores indicate more frequent work-related flow experiences. The Cronbach's α for the Chinese version of the WOLF scale was 0.913 overall[35]. And in this study, the overall Cronbach's α coefficient for the scale was 0.971.

Data collection

Data were collected using the online survey platform Sojump. The investigator requested the chairman of the Special Committee on Blood Purification to distribute the QR code of the Sojump questionnaire to head nurses of each dialysis center via a WeChat group. The group provided detailed information regarding the purpose, significance, and instructions for completing the survey. Within each center, the head nurse shared the QR code through their department's WeChat group, allowing dialysis nurses to easily complete the survey by scanning the code. The duration of the online survey was around 15 min. Written informed consent was obtained through an electronic consent form embedded in the questionnaire platform. Participants were required to read the consent information and provide their consent before proceeding to the questionnaire. Each device was limited to one submission, and IP address verification was used to prevent duplicate responses.

Data analysis

Data were analyzed using IBM SPSS Statistics 26.0. Descriptive statistics were computed to summarize participants' demographic characteristics, work-related flow, and affective domain. One-way analysis of variance (ANOVA) and independent samples t-tests were conducted to examine the effects of demographic variables on nurses' work-related flow and affective domain. Tukey's HSD post-hoc tests were applied for pairwise comparisons following significant ANOVA results. Pearson's correlation analysis was used to explore the relationship between

work-related flow and affective domain. Assumptions of normality and homogeneity of variances were verified before conducting ANOVA. All statistical tests were two-tailed, with significance set at $P < 0.05$.

Ethical considerations
This study was approved by the Ningde Normal University Affiliated Ningde Municipal Hospital Ethics Committee (NSYKYLL-2023-039). Participation was voluntary, and informed consent was obtained through the Sojump online survey platform. No personally identifiable information was collected, and confidentiality and anonymity were ensured for all respondents.

Results
Participants' characteristics
A total of 502 questionnaires were administered in this study. Of these, 32 were excluded due to completion times of less than 100 s, and 10 were omitted for containing an excessive number of blank responses. As a result, 460 valid survey responses were included in the analysis, yielding an effective response rate of 91.6%.

The majority of valid respondents were married nurses (85.2%, n = 392). A significant proportion (52.6%, n = 242) held a junior college degree. Most blood purification centers (67.0%) employed fewer than 20 nurses. Among these nurses, the majority (63.9%, n = 294) had obtained specialized certification in blood purification. Additionally, 233 nurses (50.7%) were general nurses, and over four-fifths of the dialysis nurses (82.2%) had completed further studies at higher-level hospitals for more than three months. The demographic characteristics of the participants are presented in Table 1.

Scores of different demographic factors on work-related flow in dialysis nurses
As shown in Table 2, significant differences in nurses' work-related flow scores were observed with respect to age ($P = 0.022$), hospital level ($P = 0.002$), years of experience in blood purification ($P = 0.008$), and income ($P = 0.006$).

Scores of different demographic factors on affective domain of in dialysis nurses
As shown in Table 3, significant differences were associated with age ($P = 0.001$), hospital level ($P < 0.001$), number of dialysis machines ($P = 0.039$), number of nurses ($P = 0.042$), method of employment ($P = 0.019$), professional title ($P = 0.007$), functional role ($P = 0.039$), and income ($P < 0.001$).

Score of dialysis nurses' affective domain and work-related flow
As shown in Tables 4 and 5, the total score for the affective domain of 460 dialysis nurses was 112.42 ± 20.69, with an average score of 4.50 ± 0.83 per item. The scores for each dimension were as follows: perception of professional beliefs (22.62 ± 4.33), comprehension of professional connotations (31.28 ± 5.88), evaluation of professional values (27.33 ± 5.01), and internalization of professional values (31.19 ± 6.08).

The total score for nurses' work-related flow score was 49.55 ± 12.36, with an average score of 3.81 ± 0.95 per item. The scores for each dimension were as follows: absorption (15.98 ± 3.68), work enjoyment (15.64 ± 4.03), and intrinsic work motivation (17.92 ± 5.52).

Correlation analysis of dialysis nurses' affective domain and flow at work
The Pearson correlation analysis presented in Table 6 reveals a significant positive correlation between the overall score for affective domain and the total score for work-related flow ($r = 0.660$, $P < 0.001$). Additionally, positive correlations were observed between the overall score for affective domain and the scores for each dimension of work-related flow ($r = 0.550$–0.697, $P < 0.001$).

Discussion
This research aimed to assess the extent of work-related flow and affective domain among dialysis nurses and to explore the relative importance of factors influencing these domain, as well as the correlation between them. The study involved a sample of dialysis nurses from 14 blood purification centers. The results indicated that dialysis nurses exhibited elevated levels of both affective domain and work-related flow, surpassing the average. Higher affective domain were positively correlated with stronger work-related flow. Given the relationship between work-related flow and affective domains, we recommend strategies such as increasing organizational support, improving nurse-patient ratios, and implementing targeted emotional well-being programs. These interventions could lead to improved nurse job satisfaction, reduced burnout, and better patient care outcomes.

In the current study, the total score for dialysis nurses' work-related flow was 49.55 ± 12.36, placing it at a moderate level relative to the median score of 45.5. This score exceeded that reported by Yao et al.[36], whose study in 2015 found a lower aggregate score for work-related flow among dialysis nurses (35.1 ± 10.4). This discrepancy may be attributed to the timing of Yao et al.'s study, which predates a period of significant research proliferation following the introduction of the work-related flow concept. As nursing managers increasingly recognize the advantages of fostering work-related flow, strategies to enhance this flow in the workplace have gained traction. In subscale analysis, absorption had the highest mean score, while intrinsic work motivation scored the lowest. This disparity can be attributed to the critical nature of hemodialysis procedures, where patients' conditions can fluctuate due to hemodynamic changes and dialysis imbalances, requiring nurses to maintain a high level of focus and engagement. The lower score in intrinsic work motivation likely reflects the mismatch between work intensity and compensation, as lower salaries and insufficient social support contribute to diminished intrinsic motivation.

Items	Category	Number of people(N)	Constituent ratio(%)
Age (years-old)	18–25	33	7.2
	26–35	212	46.1
	36–45	157	34.1
	>45	58	12.6
Marriage or not	Yes	392	85.2
	No	68	14.8
Number of children	Childless	86	18.7
	One child	177	38.5
	Second child and above	197	42.8
Education level	Secondary school student	36	7.8
	Junior college student	242	52.6
	Undergraduate	179	38.9
	Graduate student	3	0.7
The level of the hospital where you work	Second class A	159	34.6
	Second class B	67	14.6
	Third class A	162	35.2
	Third class B	72	15.7
Number of dialysis machines	<30	197	42.8
	30–59	184	40.0
	≥60	79	17.2
Number of nurses	<20	308	67.0
	20–39	120	26.1
	≥40	32	7.0
Whether obtain the blood purification specialist nurse certificate	Yes	294	63.9
	No	166	36.1
Employment	Staffing of public institution	233	50.7
	Contract Employees	227	49.3
Professional title	Nurse	59	12.8
	Senior nurse	185	40.2
	Nurse in charge	179	38.9
	Deputy chief nurse and above	37	8.0
Functional role	General duty nurse	378	82.2
	Head nurse	82	17.8
Whether go to a superior hospital for more than 3 months of further study	Yes	286	62.2
	No	174	37.8
Years of working in blood purification	≤5	202	43.9
	5–10	152	33.0
	>10	106	23.0
Number of night shifts per month	0	157	34.1
	1–4	174	37.8
	5–9	88	19.1
	>9	41	8.9
Income (monthly) Yuan	<3000	36	7.8
	3000–5000	199	43.3
	5001–7000	131	28.5
	7001–9000	59	12.8
	>9000	35	7.6

Table 1. Demographics characteristics of participants (N = 460).

This study also revealed that demographic factors such as age, hospital rank, years of experience in blood purification, and income are positively correlated with stronger work-related flow. Nurses possessing these characteristics tend to have a long-standing sense of professional belonging, which enables them to fully acclimate to their work environment and undergo complete role transformation[36]. Additionally, salary increases can help alleviate the pressures that nurses face in balancing professional and personal lives[37], reduce living expenses, and enhance their quality of life, fostering greater work-related flow.

Items	Category	Number of people(N)	Total score of nurse Work-related Flow Scale ($\overline{x} \pm s$)	F/t	P
Age (years-old)	18–25	33	43.21 ± 13.76	3.231	0.022*
	26–35	212	49.78 ± 13.32		
	36–45	157	50.18 ± 11.21		
	>45	58	50.57 ± 9.85		
Marriage or not	Yes	392	49.92 ± 11.98	1.386	0.169
	No	68	47.38 ± 14.25		
Number of children	Childless	86	47.44 ± 14.24	1.756	0.174
	One child	177	50.47 ± 11.16		
	Second child and above	197	49.62 ± 12.45		
Education level	Secondary school student	36	47.42 ± 12.14	2.003	0.113
	Junior college student	242	48.60 ± 13.20		
	Undergraduate	179	51.17 ± 11.07		
	Graduate student	3	54.00 ± 9.85		
The level of the hospital where you work	Second class A	159	48.37 ± 12.47	4.926	0.002*
	Second class B	67	45.52 ± 14.89		
	Third class A	162	51.61 ± 11.21		
	Third class B	72	51.24 ± 10.91		
Number of dialysis machines	< 30	197	49.03 ± 12.48	0.338	0.713
	30–59	184	50.07 ± 12.57		
	≥ 60	79	49.63 ± 11.62		
Number of nurses	< 20	308	49.19 ± 12.36	1.672	0.189
	20–39	120	49.43 ± 12.92		
	≥ 40	32	53.37 ± 9.51		
Whether obtain the blood purification specialist nurse certificate	Yes	294	50.32 ± 12.18	1.792	0.074
	No	166	48.17 ± 12.58		
Employment	Staffing of public institution	233	49.77 ± 11.27	0.390	0.697
	Contract employee	227	49.32 ± 13.41		
Professional title	Nurse	59	46.76 ± 14.46	1.815	0.144
	Senior nurse	185	49.30 ± 13.30		
	Nurse in charge	179	50.13 ± 11.26		
	Deputy chief nurse and above	37	52.38 ± 7.53	1.815	0.144
Functional role	General duty nurse	378	49.12 ± 12.87	− 1.912	0.058
	Head nurse	82	51.49 ± 9.45		
Whether go to a superior hospital for more than 3 months of further study	Yes	286	48.07 ± 12.43	− 1.051	0.294
	No	174	50.32 ± 12.24		
Years of working in blood purification	≤ 5	202	47.68 ± 13.38	4.846	0.008*
	5–10	152	50.26 ± 12.47		
	> 10	106	52.08 ± 9.36		
Number of night shifts per month	0	157	48.67 ± 13.06	1.493	0.216
	1–4	174	50.83 ± 11.67		
	5–9	88	49.77 ± 11.79		
	> 9	41	46.98 ± 13.40		
Income (monthly) Yuan	< 3000	36	42.31 ± 13.44	4.534	0.006*
	3000–5000	199	49.51 ± 13.02		
	5001–7000	131	49.97 ± 12.10		
	7001–9000	59	50.42 ± 10.31		
	> 9000	35	54.11 ± 8.32		

Table 2. Comparison of work-related flow scores of dialysis nurses by different demographic factors ($\overline{x} \pm s$) *means $P < 0.05$.

The findings also show that the total score for the affective domain of dialysis nurses was 112.42 ± 20.69, surpassing the median score of 75.5, which aligns with results from Guo et al.[34], indicating strong professional competence, passion for nursing, and appreciation of professional value. However, contrasting findings highlight variability in affective domain outcomes, Yang et al.[38], reported lower affective domain scores among nurses in high-stress settings, such as emergency and intensive care units, where intense workloads and acute

Items	Category	Number of people(N)	Total score of nurses' affective domain ($\overline{x} \pm s$)	F/t	P
Age(years-old)	18–25	33	100.61 ± 28.73	5.925	0.001*
	26–35	212	111.00 ± 22.36		
	36–45	157	115.17 ± 17.73		
	> 45	58	116.88 ± 11.91		
The level of the hospital where you work	Second class A	159	112.45 ± 20.27	6.371	< 0.001*
	Second class B	67	102.87 ± 30.12		
	Third class A	162	115.48 ± 16.70		
	Third class B	72	114.35 ± 16.30		
Number of dialysis machines	< 30	197	109.69 ± 23.75	3.278	0.039*
	30–59	184	115.04 ± 17.70		
	≥ 60	79	113.11 ± 18.18		
Number of nurses	< 20	308	110.74 ± 22.05	3.185	0.042*
	20–39	120	115.48 ± 18.49		
	≥ 40	32	117.13 ± 11.14		
Employment	Staffing of public institution	233	114.65 ± 18.60	5.566	0.019*
	Contract employee	227	110.12 ± 22.44		
Professional title	Nurse	59	106.07 ± 25.63	4.119	0.007*
	Senior nurse	185	110.74 ± 23.14		
	Nurse in charge	179	115.28 ± 15.93		
	Deputy chief nurse and above	37	117.11 ± 16.21		
Functional role	General duty nurse	378	111.49 ± 21.43	4.298	0.039*
	Head nurse	82	116.70 ± 16.30		
Income (monthly) Yuan	< 3000	36	95.19 ± 27.72	9.330	< 0.001*
	3000–5000	199	111.01 ± 22.75		
	5001–7000	131	115.62 ± 16.77		
	7001–9000	59	117.85 ± 9.88		
	> 9000	35	117.00 ± 17.09		

Table 3. Scores of different demographic factors on work-related flow of dialysis nurses ($\overline{x} \pm s$) *means $P < 0.05$.

Dimension	Score	Average score of each item
Perception of professional beliefs	22.62 ± 4.33	4.52 ± 0.87
Comprehension of professional connotations	31.28 ± 5.88	4.47 ± 0.84
Evaluation of professional values	27.33 ± 5.01	4.56 ± 0.84
Internalization of professional values	31.19 ± 6.08	4.46 ± 0.87
Total score	112.42 ± 20.69	4.50 ± 0.83

Table 4. Scores of nurses' affective domain.

Dimension	Score	Average score of each item
Absorption	15.98 ± 3.68	4.00 ± 0.92
Work enjoyment	15.64 ± 4.03	3.91 ± 1.01
Intrinsic work motivation	17.92 ± 5.52	3.58 ± 1.10
Work-related flow score	49.55 ± 12.36	3.81 ± 0.95

Table 5. Scores of nurses' work-related flow.

patient conditions may impair emotional competencies. Similarly, Ji[31] found reduced scores for professional value internalization among nurses in demanding roles across diverse hospital departments, attributing this to excessive workloads and burnout. These discrepancies likely arise from differences in clinical environments and role expectations. Unlike our multi-center study focusing on dialysis nurses in a specialized, less acute setting, Yang et al. and Ji's studies encompassed broader or more high-pressure contexts, suggesting that specialty-specific stressors influence emotional well-being. Additionally, our finding of a positive correlation

	Perception of professional beliefs	Comprehension of professional connotations	Evaluation of professional values	Internalization of professional values	Total score of affective domain
Absorption	0.643**	0.696**	0.652**	0.702**	0.697**
Work enjoyment	0.591**	0.624**	0.592**	0.647**	0.635**
Intrinsic work motivation	0.504**	0.547**	0.505**	0.568**	0.550**
Work-related flow score	0.609**	0.655**	0.613**	0.674**	0.660**

Table 6. Correlation analysis between dialysis nurses' affective domain and flow at work. **means $P < 0.001$; the correlation was significant.

between affective domain and work-related flow contrasts with Yang et al.'s[38] and Ji's[31] observations that stress and burnout may weaken emotional competencies, potentially hindering work engagement. These contrasting results underscore the need for tailored interventions to bolster emotional competencies and work-related flow in dialysis settings, accounting for unique workplace dynamics. Once nurses grasp the nuances of their vocation, most adopt a positive perspective toward their work and understand its significance. Consistent with Guo et al.'s findings, the highest scores were observed in the assessment of professional values. Guo et al.'s participants came from nine distinct departments, while this study focused solely on dialysis nurses[34]. Regardless of their specialty, nursing staff recognize the essence of nursing, develop a love for their profession, and focus on its value, which helps them understand and appreciate their work[39]. However, the score for the internalization of professional values was the lowest across the four dimensions, consistent with findings from Guo, Ji, and Yang. This suggests that the internalization of professional values requires prolonged learning and a deeper understanding for these values to be fully embraced[38,40].

This research also highlighted that the affective domain of dialysis nurses is influenced by various factors, including age, hospital tier, number of dialysis machines, staffing levels, employment status, professional title, responsibilities, and income. In terms of age, the findings of this study contrast with those of Yang et al.[38], who found that older, more experienced nurses tend to exhibit superior emotional competencies. The contradiction may arise from the fact that older nurses, after years of service, may experience emotional burnout, diminished passion, and increased stress due to the balancing of family and professional responsibilities. In contrast, younger nurses may exhibit greater emotional competency due to fewer life pressures. Factors such as hospital tier, number of dialysis machines, nurse-to-patient ratios, employment status, and professional titles all serve as indicators of the work environment, which is crucial for mitigating job-related stress and helping nurses adjust to evolving professional roles. Additionally, higher wages can alleviate the strain of balancing work and personal life, reduce living costs, and improve overall quality of life, thereby fostering emotional well-being and work-related flow among nurses.

Finally, this study found a positive correlation between the total scores for the affective domain and work-related flow among dialysis nurses, consistent with the findings of Xu et al.[41], suggesting that the affective domain influences work engagement. However, it is important to note that work engagement, although closely related, is distinct from work-related flow. Schaufeli & Bakker[42] argue that work-related flow is a peak experience of engagement, and engagement leads to work-related flow. Similarly, Kahn[43] contends that engagement is the root cause of work-related flow. This correlation may be due to the fact that nurses' work-related flow is closely tied to positive emotional experiences, which enhance their cognitive, emotional, and attitudinal engagement[44]. When nurses are free from negative emotions and experience a sense of achievement, self-worth, and job satisfaction, they are more likely to become deeply immersed in their work. This work-related flow allows them to better appreciate the value of their nursing profession, manage job-related stress, develop stable professional emotions, and focus more on their nursing duties.

Clinical implications
Studies[45] have indicated that a positive affective domain can enhance nurses' work-related flow. It is recommended that managers pay closer attention to the emotional states and experiences of nurses and work toward creating a positive work environment. This could include offering welfare benefits, increasing nurses' salaries, and optimizing nurse-to-patient ratios—measures that can stimulate nurses' work-related flow. The allocation of human resources for dialysis nurses should be adjusted based on work demands to improve their job satisfaction and efficiency. In conclusion, nursing managers should proactively explore strategies to enhance the affective domain of dialysis nurses, aiming to stabilize their professional attitudes and emotions. By doing so, they can strengthen the personal job satisfaction of dialysis nurses, increase their work-related flow, and ultimately promote the sustainable and stable development of nursing work.

Limitations
The limitations of this study include the exclusive recruitment of participants from blood purification centers within general hospitals, excluding independent centers from the research scope. Future studies could expand the sample size to improve the generalizability of the findings. Additionally, the current sample size is considered insufficient, and subsequent studies should aim to increase it. Furthermore, this research only explored the preliminary correlation between emotional aspects and work-related flow within dialysis units, without examining potential mediating factors. Future research should integrate a broader range of indicators,

investigate the intricate relationships between these factors in greater depth, and refine the experimental design to better explore the causal links between them.

Conclusion

The study revealed that nurses employed at 14 secondary and tertiary blood purification centers in Fujian Province exhibited a relatively high level of affective domain and a moderate level of work-related flow. It was found that demographic factors, including age, hospital ranking, years of experience in blood purification, and salary, were positively correlated with a stronger sense of work-related flow among dialysis nurses. Additionally, factors such as age, hospital tier, number of dialysis machines, staffing levels, employment status, professional title, job responsibilities, and earnings were found to influence the affective domain of dialysis nurses. It was observed that as the affective domain increased, the sense of work-related flow also improved. To enhance the performance of dialysis nurses, it is recommended that efforts be made to improve their affective domain.

Data availability

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

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Author contributions

Yanju Cai: conception and design of the study; analysis and interpretation of data; drafting the manuscript; final approval of the version to be submitted. Ying Chen: conception and design of the study; project administration; analysis and interpretation of data; drafting the manuscript; final approval of the version to be submitted. Qiong-dan Zhang: recruitment of participants and collection of data; final approval of the version to be submitted. Xiao Chen: recruitment of participants; final approval of the version to be submitted.

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Declarations

Competing interests

The authors declare no competing interests.

Ethical approval and consent to participate

This study was approved by the Ningde Normal University Affiliated Ningde Municipal Hospital Ethics Committee (NSYKYLL-2023-039). Written informed consents were obtained.

Consent for publication

Not applicable.

Additional information

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