# The mediating effect of work engagement on the relationship between professional calling and turnover intention among Chinese nurses: a cross-sectional study

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## Abstract

**Background** Nurse turnover is a global public health challenge, particularly in China due to high work intensity and personnel shortages. Effective nursing management and well-being strategies can reduce turnover intentions by improving job satisfaction and work environments. However, empirical evidence on how professional calling influences nurse turnover intentions in China is lacking. This study aims to investigate the mediating role of work engagement between professional calling and turnover intentions among Chinese clinical nurses.

**Methods** This is a cross-sectional survey research design. A convenience sampling method was used to select 906 clinical nurses from Sichuan and Zhejiang provinces in China. A professional calling scale, work engagement scale, and turnover intention scale were used to survey the included research subjects.

**Results** Correlation analysis results revealed that professional calling was negatively correlated with turnover intentions ($r$=-0.852, $P < 0.01$), work engagement was negatively correlated with turnover intentions ($r$=-0.790, $P < 0.01$), and professional calling was significantly positively correlated with work engagement ($r = 0.834$, $P < 0.01$). The mediation effect analysis results found that the total effect of professional calling on turnover intentions among clinical nurses was $-0.432$, with a direct effect of -0.322, accounting for 74.5% of the total effect, and the mediating effect of work engagement between professional calling and turnover intentions was $-0.110$, accounting for 25.5% of the total effect.

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**Conclusions** Enhancing work engagement through interventions that strengthen nurses' professional calling can effectively reduce turnover intentions. Specific strategies include improving work environments, providing career development opportunities, and fostering a sense of professional identity.

**Keywords** Nurses, Professional calling, Work engagement, Turnover intention, Mediating effect, Cross-sectional study

## Background

Nurses play a vital role in the normal functioning of healthcare services, bearing significant responsibilities in disease prevention, patient rehabilitation, and health promotion [1]. However, the nursing profession under current healthcare conditions often faces substantial challenges, such as low income, complex job content, and lower social status compared to physicians, these challenges are severely affecting the physical and mental health of nurses [2]. When nurses are exhausted physically and mentally due to the aforementioned factors, they may develop a psychological tendency to leave their current organization or job position, a situation referred to as turnover intention [3]. A recent survey of intensive care unit (ICU) nurses in five European countries (Poland, Spain, Croatia, Romania, and Cyprus) revealed that 22.8% of nurses are planning to leave their positions [4]. Their intentions to leave are associated with salary and benefits, better human resource allocation, and meaningful recognition. Generally, most nurses, especially female nurses, not only face high workloads but also bear the responsibility of caring for children or parents, which to some extent exacerbates their work-life conflict [5]. These conflicts, in turn, can lead to turnover intention. For example, when faced with the dilemma of caring for a sick child or returning to work, nurses may find themselves in a difficult situation. On one hand, there is the responsibility to the family, on the other hand, there is the responsibility to work, this can significantly reduce their work efficiency and subsequently lead to turnover intention [6]. The issue of nurses' turnover intention needs to be taken seriously immediately, especially in China. The traditional cultural values of responsibility, dedication, and care can put nurses in a dilemma between continuing to fulfill their professional mission and leaving their job.

Professional calling refers to an individual's firm belief that their chosen career can imbue life with a sense of meaning, and that they are filled with passion and relentless striving to achieve self-worth and serve society through their work [7]. It is one of the important motivations that encourages nurses to ensure patient safety and further improve the quality of nursing care [8]. Self-Determination Theory posits that an individual's intrinsic motivation is influenced by personal interest or a sense of satisfaction and is closely related to autonomy and self-actualization [9]. Nurses may develop intrinsic motivation, which subsequently fosters a sense of professional calling towards their work, as they derive satisfaction from alleviating patients' pain through their nursing care [10]. A study involving 237 nurses from six hospitals in Egypt, demonstrated a positive correlation between nurses' professional calling and career success [11]. This implies that as nurses' professional calling strengthens, their positive attitudes toward their careers are enhanced, which in turn is conducive to achieving career success. Additionally, a multicenter study from China, also revealed a significant correlation between nurses' professional calling and intention to stay ($r = 0.690$, $P < 0.001$) [12]. This indicates that the concept of professional calling has emerged as a salient topic within the nursing profession, warranting the active attention of nursing managers worldwide.

According to the Job Demands-Resources (JD-R) model, job demands (such as the physical and psychological efforts required at work) are considered negative aspects of a job, while job resources (such as recognition, support, or career development opportunities) are positive aspects that facilitate the achievement of work goals and mitigate the psychological costs associated with job demands [13]. Professional calling, as an important psychological resource, can be regarded as a substantial job resource that enhances work engagement [14]. For example, nurses who exhibit greater responsibility towards their positions are more likely to understand the significance and meaning of nursing care for patients, develop a sense of professional identification, and subtly adjust their attitudes towards work, thereby increasing their level of work engagement. This is supported by a study of 320 nurses, which showed a positive correlation between nurses' professional calling and work engagement ($r = 0.603$, $P < 0.01$) [15]. These findings suggest that systematically enhancing nurses' professional calling can effectively motivate them, improve job satisfaction, and increase work engagement.

This study aims to investigate the relationship between professional calling and turnover intention among Chinese nurses. Additionally, it seeks to develop a mediating model focusing on the mediating effect of work engagement. By conducting this study, valuable insights will be provided for nursing managers on how to effectively implement education on professional calling among nurses and reduce turnover intention through the indirect effect of work engagement, thereby promoting the stable development of the nursing workforce.

## Theory and conceptual framework

Kahn's work engagement theory, proposed by William Kahn [16], serves as the conceptual framework for this study. This theory emphasizes the role integration of individuals in their work, highlighting how individuals merge their self with their work roles. According to Kahn, work engagement is a multifaceted phenomenon that encompasses three dimensions: physical, cognitive, and emotional. Physical engagement refers to the energy and effort individuals invest in their work, cognitive engagement involves their attention and focus, and emotional engagement pertains to their feelings and passion towards their tasks. This comprehensive view of work engagement provides a robust foundation for understanding how individuals interact with their work environments and how this interaction influences their attitudes and behaviors.

In this study, Kahn's work engagement theory is applied to examine the relationship between professional calling and turnover intentions among nurses. The theory provides a multidimensional framework that allows us to explore the complex interplay between these variables. Specifically, we hypothesize that a strong sense of professional calling enhances nurses' work engagement, which in turn reduces their turnover intentions. By enhancing their engagement in work, nurses are more likely to experience job satisfaction and a sense of fulfillment, leading to higher retention rates. This theoretical framework not only helps us understand the mechanisms underlying nurses' job satisfaction and turnover but also provides actionable insights for improving nursing practice and policy. Figure 1 illustrates the conceptual research model based on Kahn's work engagement theory, highlighting the role of work engagement as a mediator between professional calling and turnover intentions.

In light of this, this study primarily proposes the following four research hypotheses:

**Hypothesis 1** Nurses' professional calling has a negative predictive effect on turnover intentions.

**Hypothesis 2** Nurses' work engagement has a negative predictive effect on turnover intentions.

**Hypothesis 3** Nurses' professional calling has a positive predictive effect on work engagement.

**Hypothesis 4** Nurses' professional calling has an indirect effect on turnover intentions through its impact on work engagement.

## Methods

### Research design

In accordance with the research framework, this study employs a cross-sectional survey to explore the relationships among the three variables. The study is conducted and the results are recorded strictly following the principles required for Strengthening the Reporting of Observational studies in Epidemiology (STROBE).

### Participants and sample

A total of 906 clinical nurses from three hospitals in Sichuan and Zhejiang provinces, China, were selected as participants using a convenience sampling method. The selected participants had to meet the following criteria: (1) hold a Chinese nursing practice qualification certificate; (2) be registered for clinical practice on schedule; (3) have at least six months of clinical nursing work experience; (4) provide informed consent and voluntarily participate in this study. Exclusion criteria: taking maternity leave, personal leave, or sick leave for personal reasons.

The sample size calculation for this study was based on the method proposed by Kendall, which suggests that the sample size should generally be ten (10) times the number of study variables [17]. This study included demographic variables (8), professional calling (10), work engagement (9), and turnover intention (6), totaling 33 variables. Considering 20% of the questionnaires might be invalid, the calculated sample size should be $N = 33 \times 10 \times (1 + 20\%) = 396$. Therefore, the minimum sample size should be 396 people. A total of 906 questionnaires were distributed in this study, and 836 valid questionnaires were ultimately collected, with a recovery rate of 92.2%, which meets the sample requirements.
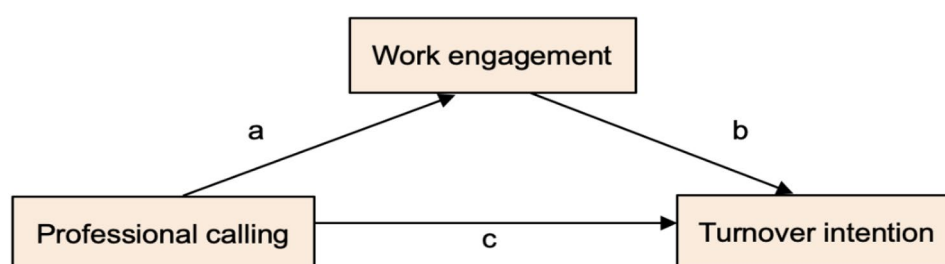


**Fig. 1** Conceptual research model

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## Evaluation methods and tools

### Sociodemographic data questionnaire

This includes items such as age, sex, education level, experience as a specialist nurse, nursing level, number of children, job satisfaction, and number of night shifts per month, totaling 8 items.

### Professional calling scale

The Professional Calling Scale is used to assess an individual's emotional and value identification with their work, as well as their sense of social responsibility and role positioning within their profession. The scale was developed by Dobrow et al. [18] in 2011 and was translated and adapted into Chinese by Zhang Chunyu in 2015 [19], and the scale has a Cronbach's α coefficient of 0.890. The scale consists of three (3) dimensions: altruistic contribution (3 items), sense of calling (4 items), and proactive endeavor (3 items), totaling 10 items. It uses a 5-point Likert scale for scoring, with each item rated from "completely disagree" to "completely agree" with scores from 1 to 5. The total score ranges from 10 to 50, with higher scores indicating a stronger sense of professional calling. In this study, the overall Cronbach's α coefficient for the scale is 0.865.

### Work engagement scale

The Work Engagement Scale is used to evaluate the attitude, performance, and satisfaction of the respondents with their work, reflecting their involvement, dedication, and enthusiasm for their jobs. The scale was developed by Schaufeli et al. in 2006 [20] and translated into Chinese and revised by Li Fuyi et al. in 2013 [21]. The scale has a Cronbach's α coefficient of 0.930. The Chinese version of the Work Engagement Scale consists of there (3) dimensions: vigor, dedication, and absorption, with 3 items for each dimension, totaling 9 items. Each item is scored on a 7-point Likert scale, ranging from "never" to "always" with scores from 0 to 6. The total score ranges from 0 to 54, with higher scores indicating a higher level of work engagement. In this study, the overall Cronbach's α coefficient for the scale is 0.865.

### Turnover intention scale

The Turnover Intention Scale primarily assesses the tendency of employees to continue in their current job positions. The scale was developed by Michaels et al. [22] and translated into Chinese and culturally adapted by Chinese scholars Li Jingyuan and Li Dongrui [23]. The scale includes three (3) dimensions: the likelihood of quitting the current job (Turnover Intention I), the motivation to seek other jobs (Turnover Intention II), and the likelihood of obtaining other jobs (Turnover Intention III), with 2 items for each dimension, totaling 6 items. Each item is scored on a 4-point Likert scale, ranging from "never" to "frequently" with scores from 1 to 4. The total score ranges from 6 to 24, with higher scores indicating a higher turnover intention and lower scores indicating a lower turnover intention. In this study, the overall Cronbach's α coefficient for the scale is 0.833.

### Pilot study

To ensure the scientific rigor and usability of the survey questionnaire, a pilot study was conducted. The initial survey assessed 40 nurses, with the sample fully complying with the inclusion and exclusion criteria. However, participants in the pilot study will not be included in the main study. The preliminary test was beneficial for identifying any issues in the research design and potential adverse principles. After completing the survey, 10 of the nurses were interviewed one-on-one and asked to share their experiences about the structure and content of the questionnaire, with their feedback being documented. Based on the feedback from these 10 nurses, we made minor adjustments to the wording of some items and adjusted the page layout to enhance clarity. The 10 nurses indicated that the questionnaire items were concise, clear, and unambiguous, and that they experienced no difficulties in completing it. Additionally, we confirmed that a survey duration of approximately 10 min was acceptable for participants, ensuring that the main study would not impose an undue burden on respondents. During the pilot study phase, the Cronbach's α for the Professional Calling Scale, Work Engagement Scale, and Turnover Intention Scale were 0.90, 0.87, and 0.89, respectively. Overall, we ensured that the study has good inclusivity and accuracy.

### Study settings and data collection

The data collection was conducted from March 1, 2024 to May 31, 2024. The three hospitals surveyed in this study are all tertiary general hospitals. Two are located in Sichuan Province in the western region of China, while the other is in Zhejiang Province in the eastern region. Each hospital employs over 1,000 nursing staff members. The educational qualifications of the nursing staff span three levels: associate degree, bachelor's degree, and master's degree. Their professional titles cover three tiers: junior, intermediate, and senior. The nursing units are comprehensive, capable of meeting the nursing needs of various departments. These hospitals are exemplary of modernized tertiary general hospitals in China. Data collection commenced following approval from the Ethics Committee of the People's Hospital of Deyang City. Before initiating the process, we reached out to nursing management experts at the hospitals involved to secure their support. We thoroughly explained the survey's procedure, objectives, and importance to the head nurses of the departments under investigation, assuring them

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that it would not pose any additional risks to the nursing staff. Once we obtained permission from the head nurses, the investigators shared the QR code of the survey questionnaire—created via the Chinese electronic platform Questionnaire Star—with the participants during departmental meetings. To safeguard the participants' rights to informed consent and privacy, an anonymized consent form was placed on the questionnaire's first page. Submitting the questionnaire was taken as implicit informed consent, and all responses were collected anonymously to protect the confidentiality of the respondents' identities. Each question in the survey was mandatory, and it typically took participants around 10 min to complete the entire questionnaire. After collecting the questionnaires, the investigators meticulously reviewed the quality of the responses, excluding any discarding those completed in under three minutes.

### Ethical considerations
This study has been approved by the Ethics Committee of People's Hospital of Deyang City (Ethical Review Number: 2024-04-016-K01). The study is conducted in accordance with the Declaration of Helsinki. All participants are involved in the survey anonymously and have provided their anonymous informed consent. We assure

participants that their participation in this study will not adversely affect their relationship with their employer hospitals. To ensure the confidentiality of the data, it will be stored in an encrypted file format, and all collected data will be accessible only to the researchers and used solely for the purpose of the study. Additionally, if participants experience any discomfort or unpleasantness during the research process, they may withdraw or halt the survey at any time. This study does not involve any interventions or experimental procedures.

### Data analysis
Data organization and analysis were conducted using the statistical software SPSS version 25.0, developed by IBM. Continuous data of the research subjects are represented by the mean ± standard deviation, and sociodemographic characteristics are expressed using frequencies and percentages. Independent samples t-tests and one-way ANOVA were used to compare the turnover intention scores of clinical nurses with different sociodemographic characteristics. Pearson correlation analysis was employed to assess the correlations between the three variables. Furthermore, the mediating effect of work engagement was analyzed using Model 4 in the Process 4.0 program within SPSS software, with bias-corrected percentile Bootstrap method for testing, setting 5000 resamples to calculate the 95% confidence interval. If the 95% confidence interval does not include 0, it indicates that the mediating effect is significant. The significance level $\alpha$ is set at 0.05 unless otherwise specified.

## Results
### Characteristics of participants
Among the 836 clinical nurses surveyed, ages spanned from 20 to 58 years, with 813 being female and 23 male. Among them, 8 had obtained a master's degree in nursing, 578 had obtained a bachelor's degree in nursing, and 250 had only an associate degree in nursing. Additionally, 242 had experience as a specialist nurse, while 594 did not have such experience. Within the common nursing level management system in China, 193 were at the N0 or N1 level, 381 were at the N2 level, 224 were at the N3 level, and 38 were at the N4 level. Regarding the number of children, 721 indicated they had at least one child, while 115 had no children. In terms of job satisfaction, 179 admitted they were not very satisfied with their current job, 326 stated they were somewhat satisfied, 218 expressed satisfaction with their current work, and 113 indicated they were very satisfied with their current job. Regarding the frequency of night shifts, 365 had more than 6 night shifts per month, 336 had between 4 and 6, 109 had between 1 and 3, and 26 did not have any night shifts. Table 1 contains their detailed data.

**Table 1** Characteristics of participants ($n = 836$)

| Variable | Category | Frequency ($n$) | Percentage (%) |
|---|---|---|---|
| Sex | Male | 23 | 2.8 |
| | Female | 813 | 97.2 |
| Education level | Associate degree or below | 250 | 29.9 |
| | Bachelor's degree | 578 | 69.1 |
| | Master's degree or above | 8 | 1.0 |
| Specialist nurse experience | None | 594 | 71.1 |
| | Yes | 242 | 28.9 |
| Nursing level | N1 or N0 | 193 | 23.1 |
| | N2 | 381 | 45.6 |
| | N3 | 224 | 26.8 |
| | N4 | 38 | 4.5 |
| The number of children | ≥1 | 721 | 86.2 |
| | 0 | 115 | 13.8 |
| Job satisfaction | Not very satisfied | 179 | 21.4 |
| | Fairly satisfied | 326 | 39.0 |
| | Satisfied | 218 | 26.1 |
| | Very satisfied | 113 | 13.5 |
| Number of night shifts per month | >6 | 365 | 43.7 |
| | 4~6 | 336 | 40.2 |
| | 1~3 | 109 | 13.0 |
| | 0 | 26 | 3.1 |

**Table 2** Univariate analysis of nurses' turnover intention ($n=836$)

| Variable | Category | Frequency (*n*) | Percentage (%) | Turnover intention (Mean±SD) | t/F | *P* |
|---|---|---|---|---|---|---|
| Sex | Male | 23 | 2.8 | 16.13±3.03 | 1.485 | 0.138 |
| | Female | 813 | 97.2 | 15.11±3.24 | | |
| Education level | Associate degree or below | 250 | 29.9 | 15.58±2.96 | 3.352 | 0.035 |
| | Bachelor's degree | 578 | 69.1 | 14.96±3.32 | | |
| | Master's degree or above | 8 | 1.0 | 14.75±4.09 | | |
| Specialist nurse experience | None | 594 | 71.1 | 15.40±3.19 | 3.688 | <0.001 |
| | Yes | 242 | 28.9 | 14.50±3.27 | | |
| Nursing level | N1 or N0 | 193 | 23.1 | 15.51±3.08 | 5.009 | 0.002 |
| | N2 | 381 | 45.6 | 15.39±3.32 | | |
| | N3 | 224 | 26.8 | 14.54±3.23 | | |
| | N4 | 38 | 4.5 | 14.32±2.48 | | |
| The number of children | ≥1 | 721 | 86.2 | 15.18±3.23 | 0.942 | 0.347 |
| | 0 | 115 | 13.8 | 14.88±3.25 | | |
| Job satisfaction | Not very satisfied | 179 | 21.4 | 15.56±3.18 | 8.610 | <0.001 |
| | Fairly satisfied | 326 | 39.0 | 15.61±3.23 | | |
| | Satisfied | 218 | 26.1 | 14.57±3.13 | | |
| | Very satisfied | 113 | 13.5 | 14.25±3.20 | | |
| Number of night shifts per month | >6 | 365 | 43.7 | 15.46±3.37 | 3.087 | 0.027 |
| | 4~6 | 336 | 40.2 | 15.06±3.17 | | |
| | 1~3 | 109 | 13.0 | 14.51±2.91 | | |
| | 0 | 26 | 3.1 | 14.38±2.96 | | |

**Table 3** Scores of nurses' professional calling, work engagement and turnover intention ($n=836$)

| Dimension | Number of items | Ideal score range | Minimum value | Maximum value | Score (Mean±SD) |
|---|---|---|---|---|---|
| **Professional calling scale** | | | | | |
| Altruistic contribution | 3 | 3~15 | 6 | 15 | 11.74±2.14 |
| Sense of calling | 4 | 4~20 | 4 | 20 | 14.07±2.81 |
| Proactive endeavor | 3 | 3~15 | 6 | 15 | 11.33±2.13 |
| Total score of professional calling scale | 10 | 10~50 | 20 | 50 | 37.14±6.38 |
| **Work engagement scale** | | | | | |
| Vigor | 3 | 0~18 | 3 | 15 | 10.52±2.23 |
| Dedication | 3 | 0~18 | 3 | 15 | 10.34±2.20 |
| Absorption | 3 | 0~18 | 4 | 15 | 10.53±2.05 |
| Total score of work engagement scale | 9 | 0~54 | 11 | 45 | 31.39±5.91 |
| **Turnover intention scale** | | | | | |
| Turnover intention I | 2 | 2~8 | 2 | 7 | 5.01±1.22 |
| Turnover intention II | 2 | 2~8 | 2 | 8 | 5.06±1.21 |
| Turnover intention III | 2 | 2~8 | 2 | 8 | 5.07±1.32 |
| Total score of turnover intention scale | 6 | 6~24 | 6 | 23 | 15.14±3.23 |

## Comparison of turnover intention scores among nurses with different characteristics

A one-way analysis was conducted on the turnover intentions of the 836 clinical nurses who participated in the study. The results revealed that there were statistically significant differences in turnover intention scores among nurses in terms of educational background, experience as a specialist nurse, nursing level, job satisfaction, and number of night shifts per month ($P<0.05$). However, there were no statistically significant differences in turnover intention scores among nurses with respect to sec and number of children ($P>0.05$) Table 2.

## Nurses' scores of professional calling, work engagement and turnover intention

Table 3 presents the scores of professional calling, work engagement, and turnover intention for the 836 clinical nurses who participated in the study. The total score for professional calling among the clinical nurses was ($37.14±6.38$), the total score for work engagement was ($31.39±5.91$), and the total score for turnover intention was ($15.14±3.23$).

## Correlation analysis of nurses' professional calling, work engagement, and turnover intention

Pearson correlation analysis revealed that there is a significant negative correlation between clinical nurses' professional calling and turnover intention ($r=-0.852$, $P<0.01$), as well as a significant negative correlation between work engagement and turnover intention ($r=-0.790$, $P<0.01$). Additionally, a significant positive correlation was found between professional calling and work engagement ($r=0.834$, $P<0.01$), (Table 4).

## Testing of work engagement as a mediator variable

The mediation effect of work engagement between professional calling and turnover intention among clinical nurses was tested using Model 4 in the Process 4.0 program within SPSS software, constructing a mediation effect model. The Bootstrap method was set with 5000 iterations, and a 95% confidence interval that does not include 0 is considered statistically significant ($P<0.05$). The results showed that the 95% confidence interval (CI) for the total effect of professional calling on turnover intention among clinical nurses was $-0.450$ to -0.414, the direct effect 95% CI was $-0.353$ to -0.290, and the indirect effect 95% CI was $-0.139$ to -0.082, all of which did not include 0, indicating that work engagement has a partial mediating effect between professional calling and turnover intention among clinical nurses. The total effect of professional calling on turnover intention was $-0.432$, with a direct effect of -0.322, accounting for 74.5% of the total effect, and the mediating effect of work engagement between professional calling and turnover intention was $-0.110$, accounting for 25.5% of the total effect (Table 5; Fig. 2).

## Discussion

This study was conducted based on Kahn's work engagement theory. We investigated the level of professional calling among nurses and employed a mediation model to verify the mediating role of work engagement in linking professional calling to turnover intention. Our study revealed significant associations among professional calling, work engagement, and turnover intention among nurses, with work engagement found to partially mediate the relationship between professional calling and turnover intention.

The results of this study showed that the turnover intention score of the nurses was ($15.14\pm3.23$) points, which is similar to the findings of Fan Dong [24], indicating that the surveyed nurses had a relatively high intention to leave their positions. This situation may be attributed to the fact that nurses often work under high levels of stress. Pressures from supervisors, patient demands, and family responsibilities can all contribute to physical and psychological strain on nurses [25]. Prolonged occupational

**Table 4** Correlation analysis of nurses' professional calling, work engagement, and turnover intention ($n=836$, r-value)

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Altruistic contribution | 1 | | | | | | | | | | | |
| 2 Sense of calling | 0.612** | 1 | | | | | | | | | | |
| 3 Proactive endeavor | 0.803** | 0.751** | 1 | | | | | | | | | |
| 4 Total score of professional calling scale | 0.873** | 0.896** | 0.934** | 1 | | | | | | | | |
| 5 Vigor | 0.614** | 0.824** | 0.757** | 0.822** | 1 | | | | | | | |
| 6 Dedication | 0.570** | 0.701** | 0.677** | 0.726** | 0.723** | 1 | | | | | | |
| 7 Absorption | 0.550** | 0.726** | 0.673** | 0.729** | 0.783** | 0.726** | 1 | | | | | |
| 8 Total score of work engagement scale | 0.635** | 0.825** | 0.772** | 0.834** | 0.921** | 0.891** | 0.921** | 1 | | | | |
| 9 Turnover intention I | -0.611** | -0.671** | -0.675** | -0.726** | -0.642** | -0.582** | -0.594** | -0.666** | 1 | | | |
| 10 Turnover intention II | -0.649** | -0.644** | -0.696** | -0.734** | -0.626** | -0.580** | -0.584** | -0.655** | 0.619** | 1 | | |
| 11 Turnover intention III | -0.656** | -0.660** | -0.677** | -0.737** | -0.681** | -0.645** | -0.623** | -0.713** | 0.597** | 0.609** | 1 | |
| 12 Total score of turnover intention scale | -0.744** | -0.766** | -0.794** | -0.852** | -0.757** | -0.702** | -0.699** | -0.790** | 0.856** | 0.859** | 0.863** | 1 |

Note: **$P<0.01$

**Table 5** Bootstrap analysis of path effect significance testing (*n* = 836)

| Effect relationship | Path situation | Effect size | *Boot SE* | 95%CI | *P* | Proportion of effect size (%) |
|---|---|---|---|---|---|---|
| Total effect | Professional calling—turnover intention | -0.432 | 0.009 | -0.450~-0.414 | <0.001 | 100 |
| Direct effect | Professional calling—turnover intention | -0.322 | 0.016 | -0.353~-0.290 | <0.001 | 74.5% |
| Indirect effect | Professional calling—work engagement——turnover intention | -0.110 | 0.014 | -0.139~-0.082 | <0.001 | 25.5% |
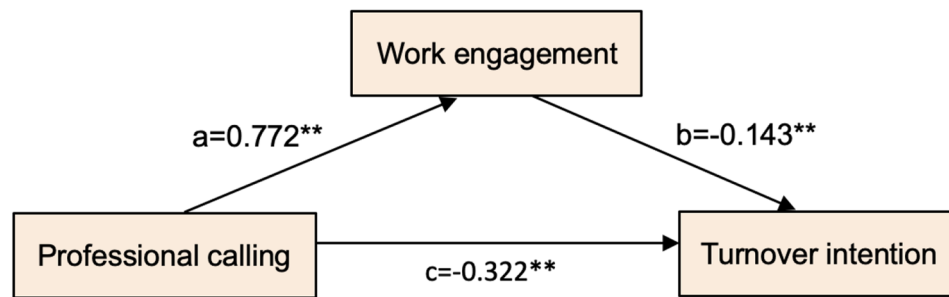


**Fig. 2** Mediation effect model of work engagement. Note: **$P$<0.01

stress leads to a higher level of turnover intention among nurses [26]. This is consistent with the key factor of job demands in the Job Demands-Resources (JD-R) model, in which these negative job demands continuously exert pressure on nurses [27]. When nurses are unable to balance work and life, they are more likely to develop turnover intentions, or even leave their positions directly, with an overall turnover rate of 2.15% [28]. However, in Western countries, particularly in Europe and America, where individualism holds a significant position, nurses place a high emphasis on work-life balance and empowerment, resulting in generally higher turnover rates [29]. This difference may be due to variations in cultural background, organizational support, and individual coping and adaptation abilities. Overall, focusing on and reducing nurse turnover is a significant global issue [30]. Only with a healthy and stable nursing workforce can the public enjoy higher-quality nursing care.

The results of this study showed that there was a negative correlation between work engagement and turnover intention among clinical nurses, meaning that work engagement could negatively predict turnover intention, which is similar to the findings of He Xucong [31]. This suggests that as the level of work engagement among nurses increases, their intention to leave decreases. Previous studies have indicated that the degree of work engagement among nurses is also positively affected by their adaptive cognitive-emotional regulation strategies; the higher the level of work engagement, the more likely nurses are to adopt adaptive cognitive-emotional regulation strategies, enabling individuals to adjust their emotional states more quickly and escape the psychological impact of negative events [32]. The professional identity

development theory also provides a robust explanation for this phenomenon. For nurses, the establishment of a strong professional identity increases their willingness to engage in their work, thereby maintaining their intention to stay and reducing turnover intention [33]. In addition, the results of this study also indicate that professional calling is negatively correlated with turnover intention. This may be because, on the one hand, nurses with a higher level of professional calling are more likely to adopt positive coping strategies in their nursing work, striving to provide better care for patients and achieve a higher sense of self-worth [34]. On the other hand, nurses with a higher level of professional calling are more likely to experience a sense of responsibility and meaning in their work, demonstrating strong motivation and passion [35]. They are more inclined to adopt positive coping strategies when facing challenges and difficulties at work, thus having a lower intention to leave. Moreover, this study also found a significant positive correlation between work engagement and professional calling, meaning that clinical nurses with higher levels of work engagement tend to have a stronger sense of professional calling. This is in line with Self-Determination Theory, which posits that an individual's intrinsic motivation can significantly influence their level of work engagement. That is, a strong sense of professional mission stimulates an individual's intrinsic motivation, thereby promoting work engagement and increasing nurses' involvement in their work [36].

The study also revealed that work engagement partially mediated the relationship between nurses' professional calling and turnover intention, accounting for 25.5% of the total effect. Our findings indicated that the higher

the level of professional calling among nurses, the more likely they are to exhibit greater work vigor and engagement, thereby reducing the level of turnover intention. Conversely, a lower level of professional calling is associated with a higher turnover intention. Kahn's theory of work engagement provides a plausible explanation for this phenomenon. Cognitive engagement enables nurses to have a clear awareness of their mission and role in nursing care, thereby maintaining a high level of physical engagement while performing nursing tasks and fostering emotional connection with colleagues or supervisors, leading to emotional engagement [37]. This is consistent with the findings of a previous study on the relationship between decent work and vigor among nurses [38]. Therefore, the focus of nursing management should be on enhancing nurses' sense of professional calling and work engagement. Doing so not only benefits nurses' physical and mental health but also effectively alleviates job burnout caused by occupational stress. As key providers of health services to patients, nurses should not only ensure patients' health and well-being but also strive to improve their own physical and psychological conditions, reducing or eliminating adverse emotions and physical discomfort caused by job strain and workload [39]. It has been reported that job crafting intervention program can enhance nurses' work passion and career commitment [40]. Thus, it is recommended that nursing managers can implement job crafting intervention program for nurses based on evidence from the literature to improve their physical and mental health, promote the establishment of work enthusiasm, professional calling, and work engagement, alleviate job fatigue, and reduce turnover rates. Additionally, nurses can also improve their physical and mental well-being through regular exercise, yoga, and mindfulness-based stress reduction therapies, thereby fostering a positive attitude towards work and life.

### Strengths
Our study highlights two potential practical insights. First, for nurses, this study underscores the positive role of establishing professional calling and enhancing work engagement in reducing turnover intention. It clarifies the significant link between nursing workforce stability and professional calling as well as work engagement, providing a reference for the literature on nurse turnover intention. Second, for nursing managers, this study emphasizes that ensuring positive work emotions among nurses can strengthen their intention to stay. This offers nursing managers a reference for conducting human resource management in nursing, such as creating an inclusive and supportive work environment, conducting workshops to promote positive emotions, and improving the allocation ratio of human resources to ameliorate nurse turnover intention. These measures can effectively ensure the harmony and sustainable development of the nursing workforce.

### Limitations
Firstly, the study is a cross-sectional one conducted over three months, collecting data at specific time points, which fails to capture the dynamic changes of these variables over time, while turnover intentions may fluctuate due to factors such as the work environment and occupational stress. Secondly, the study employed a convenience sampling method, which may not fully reflect the conditions of all clinical nurses, limiting the generalizability of the results. Furthermore, the study used electronic questionnaires for the survey, and participants may have experienced fatigue from exposure to electronic screens, affecting the accuracy of their completion of the questionnaire. Therefore, future studies should consider adopting a longitudinal design to track variable changes, implement random sampling to enhance sample representativeness, and explore various research methods for a deeper understanding. At the same time, with technological advancements, future studies should also consider how to more effectively utilize electronic questionnaires and online survey tools to improve the efficiency and quality of surveys while addressing their inherent limitations.

### Conclusion
This study investigated the work engagement, professional calling, and turnover intentions of clinical nurses in China, providing theoretical evidence for the interplay among these three factors and confirming that work engagement plays a partial mediating role between professional calling and turnover intentions among clinical nurses. This offers reference information for future investigative and interventional research. Future research is recommended to delve into the external factors affecting nurses' work engagement and professional calling from multiple dimensions, such as the work environment, organizational culture, and leadership style, and to consider implementing targeted intervention measures to enhance nurses' job satisfaction and professional loyalty, thereby reducing turnover rates. Additionally, it is suggested to employ mixed-methods research, combining quantitative data with qualitative in-depth interviews, to gain a more comprehensive understanding and to explore differences among nurses in different types of hospitals and regions, thereby enhancing the applicability and specificity of the research findings.

### Implications and recommendations
This study addresses the knowledge gap concerning the relationship between professional calling and turnover intentions among Chinese nursing staff and examines

the role of work engagement in this relationship. Nursing leaders and policymakers should carefully consider the findings of this study to develop systematic strategic plans aimed at reducing stressors in the nursing work environment, enhancing nurses' sense of professional calling, and mitigating factors that contribute to their turnover intentions. Therefore, for nursing practice, hospitals should implement interventions such as regular team-building activities and professional development workshops to boost nurses' work engagement. Optimizing shift schedules and providing more support staff can help address high workload and stress. Additionally, developing programs that highlight the social impact of nursing, such as community outreach initiatives, can foster a stronger sense of professional calling among nurses. In terms of nursing research, future studies should adopt longitudinal designs to track the long-term effects of work engagement and professional calling on nurse turnover. Expanding research to include nurses from different hospital types and specialties would enhance the generalizability of findings. Combining quantitative data with qualitative interviews could provide deeper insights into the factors influencing nurse turnover. For nursing education, incorporating modules on professional calling and work engagement into nursing curricula would help prepare students for the challenges of clinical practice. Providing hands-on training in stress management and emotional resilience, as well as establishing mentorship programs where experienced nurses guide new graduates, could also contribute to a stronger sense of professional identity and engagement. Regarding policy, policymakers should consider implementing incentive programs that reward hospitals for improving nurse work environments and reducing turnover. Increasing funding for professional development opportunities and developing policies that mandate reasonable nurse-to-patient ratios could also help alleviate workload pressures and enhance nurse satisfaction and retention.

### Author contributions
Qin Lin, Linfeng Liu, Jijun Wu, and Mengxue Fu developed the research protocol and drafted the manuscript, including the initial draft, revisions, and the final review version. Pei Chen, Kun Sun, Wen Zhang, Yanping Niu, and Jiaorong Zhao were responsible for data collection, management, and analysis. Kanlun Chen, Ling Li, and Minmin Jiang provided conceptualization, methodology, data analysis support, and review for the study. All authors read and approved the final submitted version.

## Declarations

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