Correlations Between Leadership, Self-Efficacy, and Evidence-Based Practice Competency in Nursing in a Chinese Tertiary Hospital

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Objective: This study evaluates the interplay between nursing leadership, innovative self-efficacy, and evidence-based practice competencies, aiming to identify predictive factors for enhancing nursing performance in evidence-based care.

Methods: A convenience sampling strategy was employed to enlist 1104 clinical nurses from a tertiary A-level general hospital in Lishui city. Data collection involved the utilization of a general information survey, an implementation leadership scale, the Innovative Self-Efficacy Questionnaire (IS-EQ), and a simplified scale designed to assess evidence-based practice.

Results: The mean total scores observed were 37.34±9.77 for nursing supervisor implementation leadership, 29.04±5.39 for nurses' innovation self-efficacy, and 28.80±4.98 for evidence-based practice competency. Through correlation analysis, it was found that in the actual nursing work scenarios, when head nurses effectively exert their leadership and nurses have a relatively high level of innovative self-efficacy, the nurses' evidence-based practice ability will subsequently improve, and the two show a highly significant positive correlation ($p < 0.01$). The multiple stepwise regression analysis further reveals in depth that the leadership implemented by head nurses, nurses' innovative self-efficacy, as well as nurses' educational level and the degree of participation in academic conferences are all key factors for accurately predicting nurses' evidence-based practice ability. These factors work together and account for 52.8% of the variance in evidence-based practice ability ($P < 0.05$).

Conclusion: Strengthening the leadership training for head nurses, improving nurses' professional quality, and providing more academic exchange opportunities could effectively improve nurses' evidence-based practice ability to practically optimize the quality and professional level of nursing services.

Keywords: evidence-based practice, implementation leadership, innovation, nurse, nursing supervisor, self-efficacy

Introduction

Evidence-based practice (EBP) has emerged as a significant focal point in the field of healthcare, serving a multifaceted role as a conceptual framework, a tool for decision-making, and a methodological approach. Its significance lies in bridging the gap between knowledge acquisition and practical application, thereby mitigating health disparities.[1] Ensuring the widespread adoption, implementation, and maintenance of EBP within the daily tasks of nursing is vital for addressing clinical issues, enhancing the quality of nursing care, and improving patient outcomes.[2] The endorsement of EBP by the International Council of Nurses (ICN) underscores its significance as the standard for delivering excellence in nursing care.[3] However, the translation of evidence into clinical practice and decision-making remains limited, with estimates indicating that only 20% to 50% of healthcare practices are rooted in the evidence available[4] Studies suggest that a combination of organizational and individual factors influence the adoption of EBP among healthcare professionals.[5]

Implementation leadership (IL) is defined as a leader's capacity to foster and support organizational change and innovation,[2] directly or indirectly shaping the environment for EBP within the organization. In the context of China, research on IL is still nascent. Innovation self-efficacy refers to an individual's confidence in engaging in innovative activities and their belief in their ability to creatively accomplish tasks and goals. This self-efficacy serves as a significant motivational factor in the EBP process.[6] A qualitative study[7] found that barriers and facilitators to evidence-based nursing practice include management/leadership support, fear and resistance to change, organizational communication, and education. While existing research on nurses' EBP competency tends to focus on demographic factors,[8,9] there is a gap in exploring the relationships between nursing supervisors' IL, nurses' innovation self-efficacy, and their EBP competency. At present, China attaches great importance to evidence-based nursing, which is more of a concept. It has gradually been regarded as a necessary process before the implementation of nursing programs, including the continuous improvement of daily nursing quality. Based on so many years of practical experience, it is assumed that the size of evidence-based practice ability must be related to the leadership ability of the head nurse and the innovation ability of the nurses themselves. Therefore, in this study, we aim to investigate the current status of nursing supervisor IL, nurse innovation self-efficacy, and EBP competencies in a tertiary A-level general hospital in Lishui City. We seek to analyze the correlations among these factors and explore how nursing supervisor IL and nurse innovation self-efficacy impact clinical nurses' EBP competencies. The goal is to provide insights and a foundation for enhancing nurses' EBP competencies.

Participants and Methods
Study Participants
A convenience sampling strategy was employed to select 1,104 clinical nurses from a tertiary A-level general hospital in Lishui city between November and December 2023. Inclusion criteria: (1) Possession of a nursing professional qualification certificate; (2) Clinical work experience of $\geq$ 12 months; (3) Voluntary participation in the study. Exclusion criteria: (1) Interns, advanced training nurses, and non-hospital nurses; (2) Nurses unavailable during the survey period due to leave, study, or training. Based on Kendall's sample size estimation method,[10,] which recommends a sample size of 10 to 20 times the number of variables (42 variables in this study) and allowing for a 20% margin for invalid responses, the ideal sample size ranged from 504 to 1,008. With 1104 clinical nurses participating, this study meets the required sample size.

Research Tools
General Information Survey Questionnaire
Utilizing a proprietary general information survey questionnaire, we conducted an assessment of nurses encompassing general demographic characteristics and fundamental research-related inquiries. The questionnaire encompassed two primary domains: (1) General demographic information including gender, age, educational level, marital status, number of children, departmental affiliation, monthly remuneration, tenure within the profession, professional designation, occupational role, recruitment method, nursing proficiency, engagement in academic associations, among others; (2) Basic evaluation related to research endeavors including English language proficiency, number of papers published as the first author or co-author, number of patents applied, number of research projects submissions, attendance at domestic or international academic conferences, specialized nursing certification, engagement with academic journals, and engagement in literature retrieval courses.

Implementation Leadership Scale (ILS)
The ILS, developed by Aarons et al,[11] in 2014 and translated into Chinese by Hu et al[12,13] in 2019 serves as a tool for evaluating the proactive, knowledgeable, supportive, and persistent behavior of leaders in facilitating EBP. Comprising 12 items, respondents rate each item on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree", yielding scores between 0 and 4. Higher scores on this scale indicate more effective IL within nursing supervisory roles. The scale demonstrates a commendable Cronbach's alpha coefficient of 0.93, reflecting high reliability, with individual subscales ranging from 0.86 to 0.95. There exist two variants of the scale: one intended for employee assessment of leadership and another for leadership self-assessment. This study employed the version designed for employees to evaluate their leaders.

IS-EQ

The IS-EQ, devised by Carmeli et al[14] in 2007 and later adapted for the Chinese context by Gu et al[15] was initially designed to evaluate individuals within business environments. However, its application has gained traction among nursing researchers, particularly for assessing the innovation capabilities of nursing personnel.[6,16] This questionnaire features a unidimensional structure comprising 8 items, utilizing a 5-point Likert scale ranging from "strongly disagree" to "strongly agree", yielding scores from 1 to 5. The cumulative score ranges from 8 to 40, with higher scores indicative of greater confidence in one's ability to innovate, complete tasks and achieve goals. The IS-EQ exhibits robust reliability, characterized by Cronbach's alpha coefficients ranging from 0.886 to 0.982.

Three EBP Scales—Simplified Version

The three EBP scales – the EBP Belief Scale, EBP Implementation Scale, and the Organizational Culture and Readiness Scale for System-Level EBP, were developed by Melnyk et al.[17] This was translated into Chinese in 2023 by Chinese scholars such as Liu et al.[18] Each of these scales comprises 3 items, totaling 9 items altogether. They utilize a 5-point Likert scale, where a rating of 1 corresponds to "strongly disagree" and 5 denotes "strongly agree". Cumulative scores, obtained by summing individual item ratings, reflect proficiency in EBP, with higher scores indicating greater competency. These scales have demonstrated favorable reliability, with Cronbach's alpha coefficients ranging from 0.877 to 0.921.

Operational Definitions

We provide the following operational definitions for the key variables in our study:

Leadership: Refers to the proactive, knowledgeable, supportive, and persistent behavior of leaders in facilitating evidence-based practice (EBP), as measured by the Implementation Leadership Scale (ILS). An operational definition includes the specific behaviors assessed by the ILS items, such as "encourages staff to use research findings in practice" and "provides resources to help staff implement research findings."

Self-Efficacy: Defined as an individual's confidence in their ability to innovate, complete tasks, and achieve goals within the context of nursing practice. This is operationalized using the IS-EQ, where higher scores indicate greater self-efficacy.

Evidence-Based Practice (EBP) Competency: Defined as the proficiency in EBP, encompassing beliefs, implementation, and organizational culture readiness for system-level EBP. This is measured using three scales developed by Melnyk et al, with higher cumulative scores indicating greater EBP competency.

These definitions clarify how each variable was conceptualized and measured in our study, aligning with the instruments used for data collection.

Data Collection and Analysis

In this study, a survey methodology was employed using the "Questionnaire Star" online platform to systematically generate survey questionnaires. A nursing supervisor was selected to disseminate the questionnaire: First of all, consider selecting a nursing supervisor with good communication skills and interpersonal relationships in the team, who can effectively communicate with colleagues and subordinates, clearly convey the purpose and importance of the questionnaire, and improve participation. The division of labor is based on the area or department that the nursing supervisor is responsible for to ensure that the questionnaire can cover all levels of nursing staff to avoid omissions. For example, selecting supervisors responsible for different departments or nursing units makes the survey sample more representative. Select responsible and motivated nursing supervisors who will take the initiative to follow up the issuance and recycling of questionnaires, solve possible problems in a timely manner, and encourage team members to participate actively.

Cooperation was solicited from nursing supervisors spanning various departments, who subsequently disseminated the survey's QR code within the work WeChat groups of nurses with a bachelor's degree. A standardized message detailed the study's objectives, significance, and instructions for completing the questionnaire. The specific wording of the standard message sent to participants:

> Dear [participant salutation], hello! In order to improve the quality of our care services, you are invited to participate in an important questionnaire. Your feedback is important to us and the questionnaire will take you approximately [X] minutes to complete. Please click [questionnaire link] to enter the questionnaire, thank you for your support and cooperation!

Following the nurses' informed consent, they proceeded to complete the questionnaire by scanning the QR code. To maintain anonymity, respondents were mandated to answer all questions and only one submission per IP address was permitted. Of the 1,120 questionnaires collected, 1,104 were deemed valid, resulting in an effective response rate of 98.6%. Exclusion criteria for questionnaire responses included: (1) completion duration below 3 minutes, as predetermined in the survey parameters; and (2) uniform responses across all questions.

The follow-up has been done to improve response rates: A reminder message may be sent to participants who have not completed the questionnaire about a week after the initial questionnaire is sent, with wording such as:

> Dear [name of non-respondent], we have noticed that you have not completed the nursing services survey you sent earlier. Your feedback is very valuable to us and we hope that you will take a few minutes out of your busy schedule to complete the questionnaire by clicking on the questionnaire link. Thank you for your support!

For some important participants or departments, if the response rate is low, you can arrange a special person to communicate on the phone, explain the importance of the questionnaire, answer their questions, and guide them to complete the questionnaire. A few days before the questionnaire deadline, make another announcement or notice emphasizing the deadline for completing the questionnaire and thanking all participants to create a sense of urgency and encourage more people to complete the questionnaire as soon as possible.

Statistical Methods

Statistical analysis was conducted using SPSS 25.0 software. Means and standard deviations were employed to summarize quantitative data, while categorical data were presented using frequencies and percentages. Univariate analysis employed t-tests, ANOVA, and non-parametric tests. Pearson's correlation analysis was utilized to examine the relationships between nurses' EBP competencies, nursing supervisors' leadership, and the nurses' innovation self-efficacy. Multiple stepwise regression analysis was performed to identify significant factors influencing nurses' EBP competencies, with a significance level set at α entry = 0.05. A p-value less than 0.05 was considered statistically significant.

Results

Scores for Clinical Nurses in IL, Innovation Self-Efficacy, and EBP Competencies

Clinical nurses exhibited average scores of 37.34 (±9.77), 29.04 (±5.39), and 28.80 (±4.98) for nursing supervisor IL, nurses' innovation self-efficacy, and nurses' EBP competencies, respectively. The average self-efficacy score of nursing supervisors was 37.34, which was slightly higher than the other two items, but the standard deviation of 9.77 points also showed a large difference between individuals. The average score of nurses' innovation self-efficacy was 29.04, and the average score of EBP ability was 28.80, which were relatively close, and the standard deviations were 5.39 and 4.98, respectively, indicating that the overall level of clinical nurses in these two aspects was similar, and there were some differences among individuals, but the fluctuation degree was less than that of nursing supervisors' self-efficacy.Overall, these data are helpful to understand the current level of clinical nurses in these key dimensions, and can provide reference for subsequent targeted improvement of relevant capabilities, management or training.

A breakdown of scores for each category is provided in Table 1.

Table 1 Scores for Nursing Supervisor Implementation Leadership, Nurses' Innovation Self-Efficacy, and Nurses' Evidence-Based Practice Competencies (n = 1104)

Item	Number of Items	Score Range	Score	Average Score Per Item
Total score for three EBP scales	9	9~45	28.80±4.98	3.20±0.55
Belief	3	3~15	10.39±1.70	3.46±0.57
Implementation	3	3~15	9.02±1.89	3.01±0.63

(*Continued*)

Table 1 (Continued).

Item	Number of Items	Score Range	Score	Average Score Per Item
System-level EBP organizational culture and preparedness	3	3~15	9.39±1.85	3.13±0.62
Innovation self-efficacy	8	8~40	29.04±5.39	3.63±0.67
Total score for nursing supervisor implementation leadership	12	0~48	37.34±9.77	3.11±0.81
Proactivity	3	0~12	9.07±2.56	3.02±0.85
Knowledgeability	3	0~12	9.24±2.58	3.08±0.86
Supportiveness	3	0~12	9.55±4.50	3.18±0.83
Sustainability	3	0~12	9.48±2.59	3.16±0.86

Demographic Characteristics and Univariate Analysis of Factors Affecting Nurses' EBP Competencies

Of the 1,104 clinical nurses included in the survey, the majority were female, accounting for 95.2% (1051). Regarding work experience, 43% (475) had ≤ 5 years, 37.5% (414) had 6–15 years, and 19.47% (215) had ≥ 16 years. Concerning professional titles, 61.96% (684) held junior positions, 24.28% (268) held intermediate positions, and 20.11% (222) held senior positions. Regarding salary, 13.41% (148) earned ≤ RMB 4,999 per month, 68.47% (756) earned between RMB 5,000–8,999, and 18.12% (200) earned ≥ RMB 9,000. Univariate analysis revealed that factors such as age, educational level, number of published papers (as the first author or co-author), participation in national or international academic conferences, professional position, and specialist nurse status significantly influenced nurses' EBP competencies ($p < 0.05$), as elaborated in Table 2.

Correlation Between Nurses' EBP Competencies and Innovation Self-Efficacy, and IL

Pearson's correlation analysis indicated a positive association between nursing supervisor IL and nurses' EBP competencies ($r = 0.609$, $p < 0.01$), as well as between nurses' innovation self-efficacy and their EBP competencies ($r = 0.558$, $p < 0.01$), as delineated in Table 3.

Table 2 Univariate Analysis of the Effect of General Information on the Evidence-Based Practice Competency of Clinical Nurses (n = 1104)

Item	Number of Participants [n (Percentage, %)]	Score	t/F	P
Age (years)			2.715	0.044
≤25	362(32.79)	28.43±5.01		
26~35	454(41.12)	28.86±5.08		
36~45	222(20.11)	29.49±4.82		
≥46	66(5.98)	27.97±4.42		
Educational level			3.650	0.026
Associate degree or below	291(26.36)	28.16±5.09		
Bachelor's degree	808(73.19)	29.01±4.93		
Master's degree or above	5(0.45)	31.00±2.55		
Number of papers published as first or co-author			3.816	0.022
None	615(55.71)	28.43±5.02		
1 to 3 publications	352(31.88)	29.24±5.07		
More than 3 publications	137(12.41)	29.31±4.44		
Attendance at domestic or international academic conferences			9.811	0.000
None	769(69.66)	28.42±5.15		
About once a year	257(23.28)	29.33±4.41		
More than twice a year	78(7.07)	30.74±4.46		

(*Continued*)

Table 2 (Continued).

Item	Number of Participants [n (Percentage, %)]	Score	t/F	P
Position			6.638	0.001
Nurse	842(76.27)	28.50±5.10		
Chief mentor and group leader	158(14.31)	29.58±4.54		
Head nurse (including assistant and deputy head nurse) and above	104(9.42)	30.01±4.28		
Whether a specialist nurse			−2.341	0.019
No	987(89.40)	28.68±4.95		
Yes	117(10.06)	29.81±5.09		

Note: The table only lists demographic information with statistically significant differences ($p < 0.05$).

Table 3 Correlation Analysis Between Nurses' Evidence-Based Practice Competency and Nurses' Innovation Self-Efficacy and Nursing Supervisor Implementation Leadership (r)

Item	Innovation Self-Efficacy	Leadership Total Score	Proactivity	Knowledgeability	Supportiveness	Sustainability
Total score for three EBP scales	0.558**	0.609**	0.621**	0.584**	0.561**	0.560**
Belief	0.499**	0.518**	0.528**	0.493**	0.483**	0.476**
Implementation	0.577**	0.534**	0.561**	0.516**	0.476**	0.487**
Culture and preparedness	0.453**	0.617**	0.614**	0.591**	0.580**	0.572**

Note: **$p < 0.01$.

Multiple Stepwise Regression Analysis on Factors Influencing Nurses' EBP Competencies

A multiple step-wise regression analysis was conducted utilizing the total EBP competency score as the dependent variable and statistically significant variables from univariate and correlation analyses as independent variables. Entry and exit criteria were set at α entry = 0.05 and α exit = 0.10 respectively. The assignments of variables are outlined in Table 4. The analysis revealed that factors including nursing supervisor IL, nurses' innovation self-efficacy, educational level, and participation in national or international academic conferences emerged as significant predictors, accounting for 52.8% of the variance in nurses' EBP competencies, as elaborated in Table 5.

Table 4 Independent Variable Assignment Method for Multiple Stepwise Regression Analysis of Influencing Factors on Clinical Nurses' Evidence-Based Practice Competency Scores

Independent Variable	Assignment Method
Age	≤25=1;26~35=2;36~45=3;≥46=4
Educational level	Associate degree or below = 1; Bachelor's degree = 2; Master's degree or above = 3
Number of papers published as first or co-author	None = 1, 1–3 = 2, More than 3 = 3
Attendance at domestic or international academic conferences	None = 1; About once a year = 2; More than twice a year = 3
Position	Nurse = 1; Chief mentor and group leader = 2; Head nurse (including assistant and deputy head nurse) and above
Whether a specialist nurse	No = 1; Yes = 2
Innovation self-efficacy	Input original value
Total score for nursing supervisor implementation leadership	Input original value

Table 5 Multiple Stepwise Regression Analysis of Clinical Nurses' Practice Competency Behavior (n = 1104)

Variable	Regression Coefficient	Standard Error	Standardized Regression Coefficient	T-value	P
Constant	5.775	0.770		7.498	0.000
Total score for nursing supervisor implementation leadership	0.236	0.011	0.464	20.929	0.000
Innovation self-efficacy	0.381	0.210	0.412	18.515	0.000
Educational level	1.459	0.240	0.131	6.093	0.000
Attendance at domestic or international academic conferences	0.436	0.174	0.054	2.501	0.013

Note: $R^2 = 0.530$, Adjusted $R^2 = 0.528$, $F = 309.790$, $p < 0.001$.

Discussion

Current Status of Clinical Nurses' EBP Competency, Innovation Self-Efficacy, and Nursing Supervisor IL

Current Status of Clinical Nurses' EBP Competency

The findings of this study reveal that the average score for clinical nurses' EBP competency stands at 28.80±4.98. This score exceeds the midpoint of the scale (22.5), indicating a moderate overall level of ability. However, it also underscores the necessity for further improvement. Notably, the highest scores were observed in the belief dimension, while the lowest were recorded in the implementation dimension. These results are consistent with previous studies by Zhou[19] and Conner,[20] indicating a widespread acceptance of EBP principles among nurses globally. In addition, researchers Melnyk BM[21] and Crawford CL[7] demonstrate that the implementation of evidence-based practices in healthcare systems in the United States and globally remains low. It is evident that nurses recognize the importance of EBP and are optimistic about its potential to improve clinical outcomes. Nevertheless, the translation of EBP into clinical settings remains a challenge. Clinical nurses must develop competencies in evidence retrieval, critical evaluation, and the application of evidence into practice. In China, comprehensive evidence-based training is primarily accessible at the postgraduate level, leaving many clinical nurses without formal education in this area during their undergraduate studies. Consequently, there is a significant need to elevate both the knowledge and application standards of EBP among clinical nurses. This underscores the importance of nursing management in designing evidence-based knowledge training programs tailored to various educational levels and providing increased opportunities for nurses to engage in EBP.

Current Status of Clinical Nurses' Innovation Self-Efficacy

This study indicates that the average score for clinical nurses' innovation self-efficacy is 29.04±5.39, notably exceeding the scale's midpoint of 20. This places it at a moderately high level, surpassing the findings of Ju et al.[22] Scores exhibited significant variation, ranging from 8 to 40, indicating a broad disparity in innovation self-efficacy among nurses, likely attributable to the differences in educational attainment of participants. The item scoring the highest pertained to the ability to achieve goals using innovative work methods, while the item with the lowest score related to feeling highly creative at work compared to others. This divergence may reflect nurses' adeptness in applying creative solutions to clinical challenges, despite a prevailing perception of lacking innovation in practice and skills, particularly when compared to individuals with advanced research and innovation training, such as those holding a master's degree. Nursing management should thus acknowledge the impact of nurse self-efficacy on the implementation of EBP, strive to boost nurses' psychological empowerment, and cultivate greater autonomy in EBP endeavors. Studies have shown that[22] the influencing factors of innovation self-efficacy include job satisfaction, nursing research intention, specialty nurse qualification, external research support, and nursing research atmosphere in the department.

Current Status of Nursing Supervisor IL

The findings of this study show that the total score for nursing supervisor IL stands at (37.34±9.77), surpassing the midpoint of the scale at 24, indicating a moderately high level. Among the dimensions assessed, the supportive

dimension attained the highest score, while the proactive dimension achieved the lowest score. These results are consistent with the findings reported by Li[23] and Human.[24] The elevated scores in supportive leadership behavior suggest that nursing supervisors exhibit a positive and supportive attitude towards nurses' learning and application of EBP. They foster an environment conducive to nurses acquiring knowledge of EBP and utilizing it to address clinical challenges, thereby facilitating the implementation of EBP. Conversely, the lower scores in proactive leadership behavior imply that while nursing supervisors value the management of nursing quality within their departments, they lack a proactive approach grounded in evidence-based implementation plans, objectives, and evidence translation strategies. This may indicate that nursing supervisors advocate for EBP but do not actively engage in its implementation, potentially hindering their ability to promptly identify issues during the implementation process. Therefore, in the pursuit of advancing evidence translation efforts, nursing managers should recognize the influence of nursing supervisors' IL on EBP. By strengthening the evidence-based education and training of nursing supervisors and encouraging their active participation in projects, the gap between planning and implementation can be effectively bridged.

Influencing Factors on Clinical Nurses' EBP Competency

Innovation Self-Efficacy

The study's correlation analysis showed a positive relationship between nurses' innovation self-efficacy and their proficiency in evidence-based care (r = 0.558, $p < 0.01$). This indicates that higher levels of innovation self-efficacy are associated with enhanced EBP competencies. Furthermore, the multiple stepwise regression analysis identified innovation self-efficacy as a significant predictor of nurses' EBP competencies ($p < 0.01$), consistent with the findings of Yang et al.[25] Innovation self-efficacy, defined as the belief in one's capability to creatively execute tasks and navigate challenges in evidence-based tasks, serves as a motivator and provides psychological support for engaging in EBPs.[22] Nurses with low innovation self-efficacy may encounter difficulties in critical thinking, while those with high self-efficacy demonstrate enhanced critical thinking skills, confidence in their creative abilities, and readiness to tackle challenges independently. Therefore, enhancing nurses' EBP competencies involves nursing managers focusing on boosting nurses' self-efficacy and encouraging their proactive involvement in their work.

Nursing Supervisor IL

The correlation analysis conducted in this study reveals a positive relationship between nursing supervisor IL and the EBP competencies of nurses (r = 0.609, $p < 0.01$). Notably, the proactive aspect of leadership demonstrates the most significant correlation with nurses' competencies in EBP (r = 0.621, $p < 0.01$). This suggests that proactive leadership in fostering EBPs—by mitigating barriers, establishing clear standards, and planning—contributes to the enhanced proficiency of nurses in these practices. Furthermore, the multiple stepwise regression analysis identifies nursing supervisor IL as a key determinant in improving nurses' competencies ($p < 0.01$), consistent with the findings of Ge et al.[26] The implementation of EBP stands as a primary task for nursing managers, with nursing supervisor IL representing the actions and behaviors[11] used to promote EBP implementation and cultivate an EBP culture within their respective workplaces. The advancement of EBP necessitates the leadership and organizational support of nursing managers, with nursing supervisors playing a pivotal role in enhancing nurse EBP competencies through implementation efforts. It is recommended that nursing managers encourage nursing supervisors to integrate EBP into their departmental vision, fostering an environment conducive to its implementation and providing the necessary resources to support this endeavor. Studies have shown that[27] educational background, years of management work, EBP-related training and literature reading habits are important factors affecting the implementation of leadership by head nurses.

Educational Level

The regression analysis conducted in this study indicates that educational level significantly influences nurses' EBP competency ($p < 0.01$), with EBP competency showing improvement as educational level increases. This can be attributed to variations in the nursing education curriculum across different educational levels. At the diploma and associate degree levels, the emphasis is primarily on fundamental public courses and clinical skill instruction. At the bachelor's degree level, some courses related to EBP are introduced, although they are often elective. In master's degree education, evidence-based

nursing practice capabilities are emphasized as a core competency, with comprehensive coverage of research-related knowledge. Additionally, graduation requirements for nursing master's students in China typically entail publishing articles in journals and completing a master's thesis, both of which contribute to enhancing the EBP competencies of nurses at the master's educational level. Furthermore, master's degree students tend to possess higher levels of critical thinking, decision-making skills, and innovative initiative, enabling them to address clinical challenges using evidence-based reasoning. These findings are consistent with previous research conducted by Yang[25] and Gerrish et al.[28] In light of these findings, it is recommended that nursing managers develop stratified continuing education courses in evidence-based nursing tailored to the varying educational levels of nurses. Additionally, there should be increased support for continuing education initiatives, with efforts aimed at encouraging and facilitating clinical nurses to advance their educational levels, such as the development of in-service nursing master's degree programs. Moreover, implementing talent policy measures to attract high-level talent can contribute to enhancing the overall educational level of the nursing team. Studies have shown[29] that education and training can increase clinical nurses' understanding and recognition of evidence-based nursing, which is an effective measure to improve nurses' comprehensive ability of evidence-based nursing. Organizations should increase the investment in evidence-based nursing training, and select the backbone of scientific research to participate in various evidence-based nursing related training courses held outside the institute.

Attendance at Domestic or International Academic Conferences

The findings of this study indicate a positive correlation between the frequency of nurses' participation in domestic or international academic conferences annually and their EBP competency. This relationship can be attributed to several factors: evidence-based nursing competency has been established as a professional standard by reputable organizations such as the American Nurses Association and the European Federation of Nurses Associations,[30] garnering increasing attention within China's nursing sector. The content covered in domestic or international academic conferences often includes substantial information on evidence-based knowledge or practices, facilitating learning and sharing based on evidence-based concepts. Consequently, nurses who attend these conferences more frequently have greater opportunities to acquire relevant knowledge and enhance their EBP competencies. Additionally, nurses who frequently participate in these conferences typically hold positions as nursing managers, specialist nurses, or research personnel, thereby possessing a stronger foundation in EBP competency compared to their peers. These findings are consistent with previous research conducted by Zhu[31] and Ramos-Morcillo.[32] Based on these findings, it is recommended to enhance education and training on EBP competencies through diverse methods, including academic conferences, seminars, special lectures, and practical exercises. Such approaches can enhance the interactivity and engagement of training initiatives, broaden nurses' understanding of evidence-based thinking, and cultivate a culture of evidence-based thinking within the nursing profession.

However, it is important to acknowledge the limitations of this study, which was conducted solely among clinical nurses in a tertiary A-level general hospital in Lishui city using convenience sampling, potentially affecting the generalizability of the findings. While sufficient for data collection, this may not allow for longitudinal insights into trends or changes in competencies. A cross-sectional design inherently limits the ability to observe causal relationships. Including a comparison with similar studies conducted in other regions or healthcare settings would enhance the novelty and generalizability of the results. Moreover, it is important to note that the variables considered as influencing factors were not exhaustive. Finally, this study's reliance on self-reported data might introduce response bias, as participants could overestimate their EBP competencies or innovation self-efficacy. The cross-sectional design limits the ability to infer causality. While the relationships identified are plausible, longitudinal studies are needed to confirm causal pathways.

Conclusion

The findings of this study suggest that the competency level of EBP among clinical nurses is moderate, with factors such as innovation self-efficacy, nursing supervisor IL, educational attainment, and frequency of attending academic conferences positively influencing nurses' EBP competencies. Nursing managers are encouraged to prioritize enhancing the leadership role of nursing supervisors in promoting EBPs and creating a supportive environment for their implementation. Additionally, efforts should be directed towards boosting nurses' innovation self-efficacy and encouraging proactive involvement in EBPs. At the institutional level, it is essential to support nurses in advancing their education and facilitate their participation in academic

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events both domestically and internationally. Implementing strategies to improve these influencing factors can significantly elevate the overall competency in EBP among nurses.Expand on practical steps that nursing managers and educators can take based on the findings, such as: Implementing stratified training for nurses at different educational levels. Developing mentorship programs to enhance leadership skills among supervisors. Future research should aim for broader, multi-center surveys with larger sample sizes and include additional variables to thoroughly investigate the determinants of EBP competencies among clinical nurses. Such research endeavors could provide a more comprehensive understanding of the factors influencing EBP competencies in the nursing workforce. This, in turn, would enable the development of targeted strategies to enhance these essential competencies in the nursing workforce. This study pointed out the way for nursing managers to improve the evidence-based practice (EBP) ability of clinical nurses, which is highly consistent with the global efforts to improve the EBP ability of clinical nurses, and provided a strong support for the development of global strategies for improving the EBP ability of nurses.

Abbreviations
EBP, evidence-based practice; IL, implementation leadership; ILS, Implementation Leadership Scale; IS-EQ, Innovative Self-efficacy Questionnaire.

Data Sharing Statement
The datasets used or analysed during the current study are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate
This study was conducted with approval from the Ethics Committee of The Fifth Affiliated Hospital of Wenzhou Medical University. This study was conducted in accordance with the declaration of Helsinki. Written informed consent was obtained from all participants.

Author Contributions
Meifen Chen and Xufang Huang are co-corresponding authors, and the two authors contributed the same amount to the article. All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure
The authors declare that they have no conflicts of interest regarding this work.

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