

# Evidence-Based Practice Competency and Related Factors Among Nurses Working in Public Hospitals

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## Abstract

This study aimed to describe the status and related factors of evidence-based practice (EBP) competency among nurses in China. A convenience sample of 1036 nurses were recruited from 13 public hospitals in Shanghai through an anonymous online survey. Nurses' demographic data, working data, and evidence-based nursing (EBN)-related conditions were collected by a structured questionnaire and EBP competency was assessed using the Chinese version of Evidence-based Nursing Competency Rating Scale (EBNCRS). The original score of EBNCRS among nurses was not good. The original score of evidence searching, critical appraisal, and synthesis subscale was lower than the original score of evidence transfer, situation assessment, and evidence implementation subscale. Nurses' age, hospital level, and perceived EBN knowledge were identified as significant related factors of EBP competency. There is an urgent need to upgrade the EBP competency of nurses in Shanghai, especially competency in evidence transfer, situation assessment, and evidence implementation.

## Keywords

evidence-based practice, competency, nurse, public hospital, China

### What do we already know about this topic?

Nurses do not rate themselves as competent in evidence-based practice (EBP) competency. The influence factors of EBP competency among nurses include nurse's age, EBP beliefs, EBP mentorship, EBP knowledge, and EBP culture.

### How does your research contribute to the field?

The EBP competency of nurses in Shanghai is also not good, especially in evidence searching, critical appraisal, and synthesis. The nurses' age, hospital level, and perceived evidence-based nursing knowledge are identified as affecting factors in our study.

### What are your research's implications toward theory, practice, or policy?

The nurses' EBP competency needs to be improved, and evidence transfer, situation assessment, and evidence implementation should be extra underlined and fully utilized. The younger nurses from primary or secondary hospitals should be the preferential groups to receive EBN education and training programs.

It is well known that evidence-based practice (EBP) is an indispensable part of health care and plays a critical role in reducing practical variability, enhancing health care quality, perfecting the health care system, improving patients' outcomes, and decreasing costs.<sup>1-3</sup> In the 1990s, evidence-based nursing (EBN) emerged with the development of evidence-based medicine (EBM) and has become a systematic

discipline in the EBP field.<sup>4</sup> Nurses' EBP competency is one of the preconditions for better EBN implementation.<sup>5</sup> Thus, it is of great importance to understand and improve EBP competency among nurses.

At present, scholars have given different definitions of EBP competency. Laibhen-Parkes defined EBP competency as "the ability to ask clinically relevant questions for the



purposes of acquiring, appraising, applying, and assessing multiple sources of knowledge within the context of caring for a particular patient, group, or community.”<sup>6</sup> Ruzafa-Martinez et al thought “EBP is the capability to choose and use an integrated combination of knowledge, skills and attitudes with the intention to develop a task in a certain context.”<sup>7</sup> As for EBP competency in nursing, Wang et al reported a definition that “evidence-based nursing competency (EBNC) is integration of evidence-based nursing knowledge, skill, judgment, attitude and value that nurse has in performing their entire job role to conduct evidence-based nursing practice.”<sup>8</sup>

Evidence-based practice competency is getting more and more attention globally, and most studies have focused on students in nursing field.<sup>9-11</sup> Actually, nurses working in kinds of health care settings at the frontline are the protagonists to carry out EBP for better nursing service. A set of clear EBP competency for both practicing registered nurses and advanced practice nurses in clinical settings was developed by several nursing leaders.<sup>5,12</sup> Moreover, nurses from the United States reported that they were not yet competent in meeting EBP competency, and the nurse’s age, EBP beliefs, EBP mentorship, EBP knowledge, and EBP culture were affecting factors of EBP competency.<sup>13</sup> Although there is an increasing trend on studies’ focus on EBP competency among nurses, it calls for more studies to illuminate the status and influence factors of EBP in different countries and regions.

Evidence-based nursing was introduced to China around the year 2000.<sup>14</sup> The first internationally collaborating EBN center of Joanna Briggs Institute and Fudan University (Shanghai) has been established in 2004. The first simplified Chinese textbook *Theory and practice of evidence-based nursing* was published by Fudan University Press in 2007.<sup>15</sup> Formal EBN education in school gradually became popular about 2010 for nursing postgraduates in Shanghai.<sup>16</sup> For clinical nurses working in Shanghai hospitals, the only opportunity to learn EBN may be the short-term continuing education training courses. A scoping review including 95 studies showed that publications of EBN implementation gradually rose from the year 2003 in China, and most of the researches were from the western and eastern part of China (88%). Of the 30 funded studies, 18 (60%) were

from universities/colleges, and only 2 (7%) were funded by hospitals.<sup>14</sup> For the studies conducted by clinical nurses in Shanghai, almost every steps of EBN implementation have to be done by themselves.<sup>17,18</sup> Thus, it is a challenge for clinical nurses to carry out EBN implementation, especially the evidence synthesis methodologies for nurses in low- and middle-income countries.<sup>19</sup>

Evidence-based nursing is developing rapidly in China, but problems arise at the same time. A scoping review reported publications of EBN implementation were on the rise, but also indicated an urgent requirement of Chinese EBN resources, more support and funding from clinical managerial level, cooperation between academic and clinical institutes, and a call for more rigorous studies of implementation science under a Chinese nursing context.<sup>14</sup> A bibliometric analysis showed EBN has penetrated into various nursing branches in Mainland China and become a well-recognized and relatively mature research domain.<sup>20</sup> More importance should be attached to the study design, methodological, and reporting quality of EBN projects. Evidence-based practice competency is the precondition of EBN implementation, which includes evidence searching, appraising, synthesis, applying, and evaluation.<sup>6,8</sup> Improving nurses’ EBP competency can be one of the effective solutions to deal with the aforementioned problems.<sup>5</sup> However, there is little knowledge about EBP competency among nurses in Mainland China. Thus, this study aimed to describe the state and related factors of EBP competency among nurses in Shanghai.

## Methods

### *Design and Sample*

A multicenter cross-sectional study design was used. Nurses were recruited conveniently from 3 tertiary hospitals, 4 secondary hospitals, and 6 primary hospitals (community health care centers) in Shanghai. Inclusion criteria for participants were as follows: (1) registered nurse, (2) regular employee, (3) working in public hospitals, (4) providing informed consent. Exclusion criteria were as follows: (1) intern nurse and (2) training nurse. The sample size was calculated using the formula ( $n = [\mu_{\alpha/2}\sigma/\delta]^2$ ) for estimation of population mean,

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among which  $n$  is sample size,  $\sigma = 16.77$ ,  $\delta = 1.677$ ,  $\alpha = .05$ , and  $\mu_{\alpha/2} = 1.96$ .<sup>21</sup> Therefore, one of the authors calculated that  $n = 385$ . The final sample size should be at least 462, when a 20.0% nonresponse rate of questionnaires was taken into consideration. Questionnaires were sent to 1200 participants, and full informed consents and questionnaires were provided by 1036 nurses (86.3%). Other 164 subjects failed to submit the questionnaires online.

### Data Collection

The study was approved by the ethics committee in the corresponding author's hospital, and voluntary participation was ensured. One of the authors contacted with the administrators of the included hospitals, explained to them about the current study, and acquired their permission and support for the study. The head nurses received and forwarded a website link of the questionnaires package, and reminded the nurses to fill the questionnaires in the group chat. From August 11, 2018 to November 3, 2018, questionnaires were sent to the eligible nurses via a professional online survey platform anonymously (Wenjuanxing: <https://www.wjx.cn/>). Each item was set as a mandatory entry through the system, so there were no missing data. The platform collected the data automatically when nurses submitted their questionnaires online. After the survey, 2 of the authors downloaded and checked the data from the online survey platform, and then imported the data into statistical software.

## Measures

### Nurses' Characteristics

A 13 items structured questionnaire called the General Information Form was designed to collect nurses' characteristics, which included demographic data (sex, age, race, educational level, marital status), working data (hospital level, clinical experience, professional title, job position), and EBN-related conditions (received EBN education and training, perceived EBN knowledge).

### EBP Competency

The EBP competency was assessed using the Chinese version of Evidence-based Nursing Competency Rating Scale (EBNCRS).<sup>22</sup> Several instruments were developed for assessing competency of EBP.<sup>7,23</sup> However, few scales for competency of clinical nurses are reported, and there were cultural differences when using foreign instruments. The EBNCRS was originally developed in Chinese based on the Joanna Briggs Institute Model of Evidence-Based Healthcare by the EBN team in Fudan University,<sup>22,24</sup> and permission was obtained from the original authors. The EBNCRS is a 23-item instrument to measure nurses' EBP competency, including 4 dimensions: evidence searching and critical appraisal (dimension 1: item 1 to item 7), evidence synthesis (dimension 2:

item 8 to item 12), evidence transfer (dimension 3: item 13 to item 15), situation assessment and evidence implementation (dimension 4: item 16 to item 23). The 5-point Likert-type scale was used in the EBNCRS, which is "unclear = 0," "complete nonconformity = 1," "basic nonconformity = 2," "basic conformity = 3," "complete conformity = 4." The total possible original scores using the Likert-type scale ranged from 0 to 92 points. In addition, the EBNCRS can be divided into 2 subscales, which are named evidence searching, critical appraisal and synthesis subscale (subscale 1: dimension 1 and dimension 2), and evidence transfer, situation assessment, and evidence implementation subscale (subscale 2: dimension 3 and dimension 4). Cronbach's alpha coefficient of EBNCRS was .951, test-retest reliability coefficient of EBNCRS was .900, and the interrater reliability among raters was .702. The scale content validity index was 0.987. Three components were revealed by exploratory factor analysis, accounting for 62.891%. The factor structure of 2 models was tested using confirmatory factor analysis and showed acceptable fit (See online supplemental material).<sup>22</sup>

### Data Analysis

SPSS for Windows, version 25.0 (IBM, Chicago, IL), was used to analyze the data. Descriptive statistics were used by frequency, proportion, mean, and standard deviation for continuous and categorical data. Standardized score was equal to original score divided by number of items. Univariate analyses were performed by  $t$  test to demonstrate differences of EBP competency based on nurses' characteristics. A multiple linear regression analysis was performed to identify the related factors of EBP competency, and variables with statistical significance in univariate analysis were used as independent variables. The statistic values of independent variables were assigned as follows: Age (30 years or below = 0, 31 years or above = 1), Race (Minority = 0, Han = 1), Educational level (Associate/baccalaureate degree or below = 0, Graduate degree or above = 1), Hospital level (Primary/Secondary = 0, Tertiary = 1), Job position (General duty nurse = 0, Head nurse/deputy head nurse or above = 1), Received EBN education/training (No = 0, Yes = 1), and perceived EBN knowledge (No = 0, Yes = 1). All probabilities quoted were 2-tailed and were considered statistically significant when  $P < .05$ . However, to include more potentially significant variables in the multiple linear regression analysis, the significance level in univariate analyses was reset from the traditional level of .05 to .20.<sup>25,26</sup> Thus, variables with  $P < .20$  in univariate analyses were included in the multiple linear regression analysis.

## Results

### Nurses' Characteristics

For the 1036 nurses, the average age was  $31.64 \pm 8.132$  years, and the average duration of clinical experience was

**Table 1.** Nurses' Characteristics (N = 1036).

Characteristics	Categories	No. (%)
Gender	Female	1031 (99.5)
	Male	5 (0.5)
Age	30 years or below	544 (52.5)
	31 years or above	492 (47.5)
Race	Minority	14 (1.4)
	Han	1022 (98.6)
Educational level	Associate/baccalaureate degree or below	1029 (99.3)
	Graduate degree or above	7 (0.7)
Marital status	Single	406 (39.2)
	Married	630 (60.8)
Hospital level	Primary/Secondary	560 (54.1)
	Tertiary	476 (45.9)
Clinical experience	5 years or below	357 (34.5)
	6 years or above	679 (65.5)
Professional title	Primary or below	709 (68.4)
	Intermediate or above	327 (31.6)
Job position	General duty nurse	938 (90.5)
	Head nurse (deputy) or above	98 (9.5)
Received EBN education/training	No	304 (29.3)
	Yes	732 (70.7)
Perceived EBN knowledge	No	254 (24.5)
	Yes	782 (75.5)

Note. EBN = evidence-based nursing.

11.37 ± 9.119 years. Most participants were female (99.5%), had an associate/baccalaureate degree or below (99.3%), and were general duty nurses (90.5%). Meanwhile, 732 nurses (70.7%) had received EBN education and (or) training, and 782 nurses (75.5%) perceived EBN knowledge (Table 1).

### Summary Statistics of the 23 Items by the EBNCRS

The scores on EBNCRS item level were from 1.96 ± 0.749 to 2.58 ± 0.987. The 5 highest scoring items were item 22, item 20, item 21, item 23, and item 19, and the scores were 2.58 ± 0.987, 2.53 ± 1.051, 2.49 ± 1.018, 2.43 ± 1.046, and 2.40 ± 1.032, respectively (Table 2).

### The Nurses' Status of EBP Competency

The nurses' original score of EBNCRS was 51.31 ± 11.213 (standardized score: 2.23 ± 0.487). The original score of evidence searching, critical appraisal, and synthesis subscale was 25.31 ± 7.081 (standardized score: 2.11 ± 0.590), which was lower than the original score of evidence transfer, situation assessment, and evidence implementation subscale 26.00 ± 6.053 (standardized score: 2.36 ± 0.550). The original score of situation assessment and evidence implementation

dimension was 19.09 ± 5.081 (standardized score: 2.39 ± 0.635), which was the highest score among the 4 dimensions of EBNCRS. Dimensions 1, 2, and 3 were 15.18 ± 4.111 (standardized score: 2.17 ± 0.587), 10.13 ± 3.287 (standardized score: 2.03 ± 0.657), and 6.91 ± 1.896 (standardized score: 2.30 ± 0.632), respectively.

### EBP Competency Based on Nurses' Characteristics

Nurses 30 years old or below had better EBP competency than senior nurses ( $t = 2.163, P < .05$ ). The EBNCRS score was higher among nurses working in tertiary hospital than nurses from primary hospitals and secondary hospitals ( $t = -2.621, P < .01$ ). Nurses who had received EBN education/training and with perceived EBN knowledge had higher score of EBNCRS than nurses who reported no EBN education/training and knowledge ( $t = -5.579, P < .001; t = -6.383, P < .001$ ). No significant difference was found on sex, race, educational level, marital status, clinical experience, professional title, and job position (Table 3).

### Factors Affecting Nurses' EBP Competency

A multiple linear regression analysis was performed with independent variables that significantly affected nurses' EBP competency in the univariate analyses. The significant related factors were age ( $\beta = -0.132, P < .001$ ), hospital level ( $\beta = 0.069, P < .05$ ), and perceived EBN knowledge ( $\beta = 0.162, P < .01$ ). The regression model was statistically significant ( $F = 9.858, P < .001$ ) and had an explanatory power of 6.3%. No significant collinearity was found in the multicollinearity test with tolerances from 0.393 to 0.996 and variance inflation factors from 1.004 to 2.542 (Table 4).

### Discussion

In this study, 1036 nurses from 13 public hospitals in Shanghai were assessed using EBNCRS. The level of EBP competency was not good, which has also been reported in previous studies.<sup>13,27</sup> A study done by Wang et al also showed similar results with this study, and the nurses' original score of EBNCRS was 54.39 ± 16.77 in her study.<sup>21</sup> The original scores were standardized, and nurses' standardized score in evidence transfer, situation assessment, and evidence implementation was better than that of standardized score in evidence searching, critical appraisal, and synthesis at the subscale level. Meanwhile, nurses' standardized score in situation assessment and evidence implementation was the best among the 4 dimensions of EBNCRS, followed by evidence transfer, evidence searching and critical appraisal, evidence synthesis. Results of subscale and dimension level were consistent with the results of item level, and all the 5 highest scoring items were belonging to situation assessment and evidence implementation dimension. Lam and Schubert have reported

**Table 2.** Evidence-Based Nursing Competency Rating Scale Item-Level Summary Statistics (N = 1036).

Items <sup>a</sup>	Mean ± SD	
1. I can propose structured nursing questions using the PICO (P-population; I-intervention; C-control; O-outcome) on aspects I was querying.	2.22 ± 0.688	
2. I know the databases to get evidence resources.	2.10 ± 0.781	
3. When conducting an evidence search, I will first try to search for evidence-based nursing practice guidelines, evidence summaries, systematic reviews, or meta-analysis related to the problem, and then search for original research or expert experience such as randomized controlled trials, cohort studies.	2.27 ± 0.702	
4. I can get comprehensive literature resources at home and abroad according to my searching purpose.	2.27 ± 0.695	
5. I have mastered the research methods of common research types.	2.10 ± 0.741	
6. For different data types, when making statistical descriptions or statistical inferences, I can basically judge the indicators or methods that can be used.	2.11 ± 0.713	
7. I can use the appropriate literature quality assessment tools to evaluate the quality of literature of different research design types.	2.11 ± 0.705	
8. I can extract key information from domestic and international nursing-related literature smoothly.	2.17 ± 0.698	
9. I can use some software to analyze and explain the homogenous quantitative research process and results.	1.99 ± 0.748	
10. I can summarize, classify, and interpret quantitative research results and qualitative research results that are not suitable for meta-analysis.	1.96 ± 0.749	
11. I can mark the quality level of evidence and preliminarily judge the level of recommendation based on evidence grading standards.	1.97 ± 0.744	
12. I can organize the latest best evidence resources into simple, easy-to-read tools such as best practice information books and evidence summaries.	2.04 ± 0.730	
13. I can understand the clinical practitioner's needs for evidence content, information format, and delivery methods through methods.	2.31 ± 0.689	
14. I can choose effective ways to disseminate evidence.	2.35 ± 0.689	
15. I can guide the adaptation of evidence into clinical practice by organizing special lectures, special training, and group discussions through various resources.	2.25 ± 0.699	
16. Before applying the evidence, I can plan for nursing changes by assessing patients' wishes, patients' needs, and patients' benefits.	2.27 ± 0.665	
17. Before applying the evidence, I can try to understand the characteristics of the nursing team to plan for nursing changes.	2.22 ± 0.676	
18. Throughout the application of the evidence, I can dynamically assess whether the evidence application site has the conditions for applying evidence in the policy and environment.	2.17 ± 0.673	
Items for general duty nurse <sup>a</sup>	Items for head nurse (deputy) or above <sup>a</sup>	Mean ± SD
19A. I can present my own opinions and suggestions on evidence-based nursing practice procedures, assessment tools, operational standards, and so on.	19B. I can promote clinical practitioners' application of evidence by developing evidence-based nursing practice procedures, assessment tools, and operational practices.	2.40 ± 1.032
20A. I am willing to join the evidence-based nursing practice team.	20B. I can actively seek leadership support to select suitable candidates to form an evidence-based nursing practice team.	2.53 ± 1.051
21A. I am able to follow the evidence-based nursing practice process and carry out nursing work.	21B. In the application of evidence, I can monitor the important links to ensure the quality of evidence application.	2.49 ± 1.018
22A. I can share the confusion, experience or suggestions in the evidence application with colleagues, team members or managers.	22B. I can strive for or strengthen incentives to stimulate team members to actively apply evidence.	2.58 ± 0.987
23A. I am able to form a summative evaluation of the evidence application based on an assessment of the effects of evidence application.	23B. I am able to develop a comprehensive evaluation system to fully reflect the effects of the evidence application.	2.43 ± 1.046

<sup>a</sup>The full contents of each item were presented in the supplemental material.

nursing students were good at basic EBP competency such as searching for evidence, but were less able to describe higher-order activities such as integrating evidence to plan EBP

changes or disseminating best practices.<sup>27</sup> Results of these 2 studies were not similar, which may be attributed to that the students have little experience in clinical work.

**Table 3.** Univariate Analyses of Evidence-Based Practice Competency (N = 1036).

Characteristics	Categories	Mean $\pm$ SD	t	P
Gender	Female	51.33 $\pm$ 11.229	1.101	.271
	Male	45.80 $\pm$ 4.764		
Age	30 years or below	52.02 $\pm$ 11.378	2.163	.031
	31 years or above	50.51 $\pm$ 10.985		
Race	Minority	55.86 $\pm$ 10.197	1.530	.126
	Han	51.24 $\pm$ 11.218		
Educational level	Associate/baccalaureate degree or below	51.25 $\pm$ 11.194	-1.926	.054
	Graduate degree or above	59.43 $\pm$ 11.830		
Marital status	Single	51.38 $\pm$ 11.082	0.177	.860
	Married	51.26 $\pm$ 11.305		
Hospital level	Primary/Secondary	50.46 $\pm$ 10.364	-2.621	.009
	Tertiary	52.30 $\pm$ 12.070		
Clinical experience	5 years or below	51.82 $\pm$ 11.494	1.079	.281
	6 years or above	51.03 $\pm$ 11.061		
Professional title	Primary or below	51.54 $\pm$ 11.429	1.000	.318
	Intermediate or above	50.79 $\pm$ 10.728		
Job position	General duty nurse	51.16 $\pm$ 11.386	-1.327	.185
	Head nurse (deputy) or above	52.73 $\pm$ 9.319		
Received EBN education/training	No	48.33 $\pm$ 11.192	-5.579	<.001
	Yes	52.54 $\pm$ 10.995		
Perceived EBN knowledge	No	47.48 $\pm$ 10.589	-6.383	<.001
	Yes	52.55 $\pm$ 11.134		

Note. EBN = evidence-based nursing.

**Table 4.** A Multiple Linear Regression Analysis of Evidence-Based Practice Competency (N = 1036).

Variables	B	SE	$\beta$	t	P
Age	-2.960	0.727	-0.132	-4.071	<.001
Race	-5.323	2.937	-0.055	-1.813	.070
Educational level	5.927	4.182	0.043	1.417	.157
Hospital level	1.550	0.686	0.069	2.258	.024
Job position	2.026	1.236	0.053	1.639	.101
Received EBN education/training	1.362	1.170	0.055	1.164	.245
Perceived EBN knowledge	4.221	1.254	0.162	3.366	.001
R <sup>2</sup>	.063				
Adjusted R <sup>2</sup>	.057				
F	9.858				
P	<.001				

Note. EBN = evidence-based nursing.

Generally speaking, knowledge producers (researchers) and knowledge implementers (users) have different roles in current EBP.<sup>28-30</sup> Researchers always engage in professional evidence searching, appraisal, and synthesis and provide assistance when users transfer evidence, assess situation, and apply evidence. Users mainly carry out evidence dissemination, context assessment, and evidence implementation together with researchers in specific practical situations. Most clinical nurses are evidence users and are good at aspects related to the evidence dissemination, evaluation, and application. In addition, nurses are used to performing

standardized policies and procedures approved by committees,<sup>14</sup> which may be one of the major reasons for the deficiency of evidence searching, critical appraisal, and synthesis. It is suggested that the specific functions of different roles should be further clarified in the future, which can play their respective strengths and promote the development of EBN. For example, evidence transfer, situation assessment, and evidence implementation of most nurses should be fully utilized and encouraged, while research nurses and postgraduate degree nurses have to be equipped with comprehensive evidence-based care. To the EBN education and training for

clinical nurses, evidence searching, critical appraisal, and synthesis involve literature search, epidemiology, statistics, EBM, and so on, which generally requires systematic, long-term theoretical education, and practical training to better master, and short-term EBN training may not get obvious effects. However, it is not necessary to ask every nurse to master the aforesaid competency expertly. Evidence transfer, situation assessment, and evidence implementation should mainly apply the integrated evidence into the practical context and carry out evidence-based clinical practice and evaluation. The main feature of this process is that it is more practical and fits in well with clinical nursing practice. In summary, the plasticity of nurses' evidence transfer, situation assessment, and evidence implementation competency is higher. The EBN education and training for most nurses should be focused on them, as well as the EBN research and practice.

In the univariate analyses, EBP competency was significantly affected by age, hospital level, EBN education/training, and EBN knowledge. Nurses presented better EBP competency if they were 30 years old or below, working in tertiary hospital, received EBN education/training, or perceived EBN knowledge. However, only age, hospital level, and EBN knowledge showed significant difference in the multiple linear regression analysis, which revealed that these were related factors of nurses' EBP competency. Melnyk et al have reported that younger nurses were equipped with higher EBP competency, and there was a moderate positive association between EBP competency and EBP knowledge.<sup>13</sup> Results of this study partly agree with Melnyk's study. The factor EBN education/training was excluded in the final model, and the possible reasons may be that the effects of education and training were mediated by EBN knowledge.

Nurses, 30 years old or below, were among the first generation to receive school education in EBN in China. For EBN in clinical care, most EBN research, practice, and continuing education were done in tertiary hospitals.<sup>17,18,31</sup> Based on this situation, nurses working in tertiary hospitals had more opportunities to learn and practice EBN than nurses from primary or secondary hospitals. Evidence-based nursing knowledge is the basics of EBP competency<sup>13</sup> and can provide theoretical guidance when nurses do EBN. As younger nurses have higher EBP readiness and are more receptive to new things, it is recommended to encourage them to engage in EBN. Considering the equality of health care, more attention has to be paid to nurses working in primary or secondary hospitals when designing EBN education and training programs. Evidence-based nursing education and training can enrich nurses' EBN knowledge<sup>32-34</sup> and then improve nurses' EBP competency.<sup>13</sup> Therefore, it will highlight more practical and social impacts to involve younger nurses in EBN and focus on enriching EBN knowledge among nurses from primary or secondary hospitals. In addition, the explanatory power of the final regression model was not as good as expected, implying that there were other

stronger factors affecting EBP competency. The EBN experience (research or practice) may be one of the stronger related factors, which could be comparable to the mentorship.<sup>13</sup> Thus, to improve nurses' EBP competency, it is not enough to acquire knowledge alone, but also essential to use and demonstrate them in practice.

There were several limitations in this study. First, the samples were not randomized, and the results might not be fully representative of all nurses in Shanghai. However, the actual sample size in this study was much bigger than the calculated sample, which may reduce the possibility of selecting offsets. Second, the number of nurses with graduate degree or above was small, which may be the reason why no significant differences were found based on nurses' educational level. Third, the nurses' characteristics investigated in this study may not be comprehensive, such as characteristics related to EBN experience. Although EBP mentorship has been reported barely in China, other possible related factors should be explored in future studies.

## Conclusions

Nurses' EBP competency in Shanghai was not good, and there is an urgent need to upgrade the nurses' EBP competency through EBN education and training. To most nurses, competency in evidence transfer, situation assessment, and evidence implementation should be fully utilized and encouraged, and more attention should be paid to these aspects in EBN education and training. The related factors of EBP competency included nurses' age, hospital level, and EBN knowledge, and it is suggested to involve younger nurses in EBN and focus on increasing EBN knowledge among nurses working in primary or secondary hospitals. To improve nurses' EBP competency, it is not enough to acquire knowledge alone in EBN education and training, but also essential to use and demonstrate EBN knowledge in clinical practice.

## Authors' Note

All listed authors meet the authorship criteria and that all authors are in agreement with the content of the manuscript.

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**Supplemental Material**

Supplemental material for this article is available online.

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