Research Capacity and Research Training Needs of Clinical Nurses in Suzhou, China

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abstract

Background: Several studies examined the research capacity of nurses in the United States and other countries. However, the research capacity of clinical nurses in China has not been systematically surveyed. Thus, there is a need to investigate and report the research capacity and training needs of nurses in China. **Method:** A cross-sectional survey was conducted using a structured questionnaire. **Results:** In 17 hospitals, 2,324 clinical nurses were surveyed. The results indicated that most of the nurses self-assessed that their research capacity was relatively low, as the average score was 65.47 ± 21.31 (total score = 30 to 150). Most of the nurses (n = 1,890, 83.1%) expressed the need for training in research. Linear regression analysis showed participation in nursing research practices and pursuing a higher degree could improve nurses' research capacity. **Conclusion:** Nurses' research capacity needs further improvement. More training courses on nursing research tailored to the requirements of nurses are needed. [*J Contin Educ Nurs*. 2019;50(9):423-432.]

Nursing research plays a critical role in the development and progress of nursing as a discipline. It is an integral part of nursing and can advance its progress (McKee, Codd, Dempsey, Gallagher, & Comiskey, 2017; Timmins, McCabe, & McSherry, 2012). Evidence-based nursing interventions can improve the quality of care, optimize patient outcomes, and provide safe and quality patient care in clinical practices. As the nearest professional to the patient, clinical nurses are most qualified to raise clinically relevant research questions (Scala, Price, & Day, 2016). The key element of nursing research is clinical nurses and nurse educators. The application of nursing research results mainly depends on clinical nurses. Ideally, clinical nurses should be the ones to find problems in patient care and implement nursing research that aims to solve those problems. The development of nursing research can promote the establishment of a new nursing theory system, promote the implementation of evidence-based nursing (Duffy, Culp, Sand-Jecklin, Stroupe, & Lucke-Wold, 2016), and improve patient outcomes. A research conducted in South Africa indicated that enhancing the research ability of clinical nurses has been identified as a priority in nursing development (Comiskey et al., 2015). Therefore, the research capacity of clinical nurses is garnering greater attention and needs to be further enhanced (Duffy et al., 2016; McKee et al., 2017).

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BACKGROUND

Research capacity is defined as the ability to conduct, use, and sustain research (Duffy et al., 2015). Researchers in the Phillipines, Ireland, Spain, Norway, United States, and United Kingdom have found that many factors limit clinical nurses' improvement of research capacity, such as lack of time and energy (Torres et al., 2017), difficult access to infrastructure and training (McKee et al., 2017; Moore, Crozier, & Kite, 2012; Scala et al., 2016; Torres et al., 2017), lack of resources and funding support (Akerjordet, Lode, & Severinsson, 2012; Corchon, Portillo, Watson, & Saracíbar, 2011; Lode, Sørensen, Salmela, Holm, & Severinsson, 2015; Timmins et al., 2012; Torres et al., 2017), lack of knowledge and skills in nursing research (Akerjordet et al., 2012; Caldwell et al., 2017; Timmins et al., 2012), and the need for opportunity or experience (Caldwell et al., 2017; Timmins et al., 2012).

By the end of 2016, China had 3.5 million clinical RNs (National Bureau of Statistics of China, 2017) and is among the countries that have the highest numbers of RNs in the world. In China, there are three levels of professional titles for RNs—primary title (nurse and senior nurse), intermediate title (supervisor nurse), and senior title (associate chief nurse and chief nurse). Publishing research articles on clinical nursing practice and being the principal investigator (PI) in scientific research projects are the prerequisites for the promotion of professional titles (Zhang, Liu, Zhang, Yu, & Ma, 2014). However, in recent years the majority of nursing research articles in China focused on nursing experience or case reports and lacked a systematic research process. Even worse, a few clinical nurses paid ghost writers to write and publish articles for them, which meant that although some nurses were promoted to higher professional titles, their research capacity did not improve. Furthermore, the research capacity of clinical nurses in China has not been systematically measured. Most Chinese clinical nurses have the initial degree of a secondary or advanced diploma (You, Ke, Zheng, & Wan, 2015). In the current Chinese education system, secondary diploma and advanced diploma education does not include nursing research in their curricula; most nursing undergraduate programs have a normative nursing research course and related nursing scientific research training—master's programs in nursing contain standard scientific research training, thesis proposals, research implementation, and publishing research articles. A study in China shows that the highest degrees of more than 80% of Chinese nurses in first-class hospitals is an advanced diploma (60.8%) or a baccalaureate degree (21.4%) (Hu et al., 2013). This means that there is a great number of Chinese clinical nurses who enroll in continuing education programs to improve their education level, in which they have the opportunity to receive training in scientific research.

Researchers in Australia, Norway, and the United States pointed out that research training and education was significant to enhance clinical nurses' research capacity (Akerjordet et al., 2012; Scala et al., 2016; Short, Jackson, & Nugus, 2010). An Ireland-based study has reported that demand-based training courses can improve the nursing research ability of clinical nurses (McKee et al., 2017). Nevertheless, the current situation of clinical nurses' scientific research capacity and their needs for scientific research training have not been reported in the literature. Therefore, an investigation of the scientific research capacity of clinical nurses in eastern China and their demands for training in scientific research was conducted to provide evidence for the design and organization of research training courses and to improve the research capacity of clinical nurses.

METHOD

Study Design

A descriptive, cross-sectional design was used for this study.

Data Collection

Sample and Procedure. The research was conducted between September 2017 and October 2017 in all first-class hospitals (N = 17) in Suzhou in eastern China, most of which were general hospitals with the exception of one traditional Chinese medicine hospital, one infectious disease hospital, one children's hospital, and one psychiatric hospital. The sample size of each hospital was calculated according to the total number of clinical nurses, and the sampling proportion ranged from 13% to 30%. One emergency department (ED), one intensive care unit, one operating room, two to three medical units, and two to three surgical units were conveniently sampled for each hospital, and all of the clinical nurses in the sampled department were surveyed at the department meeting, where all nurses were supposed to be present except for those on maternal leave or sick leave.

The research was conducted after written permission was obtained from the Suzhou Nursing Association (SNA), and the research was ethically approved by SNA. The data were collected by researchers who were members of the SNA Nursing Research Committee. All of the researchers received training about the research aims and the methods of data collection before the survey was conducted to guarantee the reliability and validity of the results.

Researchers visited 17 hospitals to inform all of the directors of the nursing departments of the survey. After obtaining consent from the nursing department, researchers visited the selected departments and explained the aims

of the study to head nurses and all the other nursing staff who attended the department meeting. All participants completed the questionnaires onsite, and researchers collected the forms from the 17 hospitals over a period of 2 months.

Survey Instruments. The questionnaire consisted of three parts: sociodemographic data (self-designed), Self-Evaluation Questionnaire of Nursing Research Capacity (SEQ-NRC) (Pan, 2011), and research training needs (self-designed). It took approximately 15 minutes to complete the questionnaire. A brief introduction to each part of the survey is described in the following section.

The sociodemographic data collection form. This part consisted of 10 questions including gender, age, years of working, education level (initial degree), education level (highest degree), professional title, position (head nurse, staff nurse), employment mode (off-staff or contract-based nurses and in-staff nurses) (Shang et al., 2014), department (ED, intensive care unit, operating room, medical unit, and surgical unit), and scientific research experience (whether they have participated in scientific research prior to the survey).

In China, many nurses improve their academic levels through continuing education, so we included two questions regarding education level (initial degree and highest degree) in the questionnaire. The two main forms of employment mode for nurses in China (in-staff nurses and contract-based or off-staff nurses) are different from other countries. An in-staff nurse is a type of position with state-guaranteed lifetime employment that comes with a steady income and extensive benefits including housing, health insurance, and pension. Contract-based or off-staff nurses do not hold lifetime employment or job-related benefits (Shang et al., 2014).

The SEQ-NRC. The first edition of SEQ-NRC was developed by Liu Ruishuang in 2002, and a revised version was developed by Pan Yinhe in 2011(Pan, 2011). In this study, the revised version by Pan Yinhe was used, which comprised 30 questions rated on a 5-point Likert scale (1 = *unable to do* to 5 = *fully capable of doing*). SEQ-NRC covers six dimensions: identification of research question (three items), literature review (five items), research design (five items), implementation of research (six items), data analysis (five items), and academic article writing (six items). The Cronbach's alpha coefficient of the questionnaire was .86, and those for the six dimensions ranged from .65 to .76. The test–retest reliability of the questionnaire was .90 (Pan, 2011).

Research training needs of clinical nurses. This part included 10 self-designed questions. The first question was "Do you have needs for training in nursing research?" The rest of the 10 questions were for areas of training, which included literature review, research topic selection, research design, data collection, data analysis, academic article writing, patent application, information about research project application, writing research proposals, and English training. Respondents could choose at least one from the 10 specific areas of training.

Data Analysis

Data were analyzed using SPSS® 18.0 for Windows. Frequencies, percentages, means, and standard deviations were used for describing the demographics of participants. Chi-square test of homogeneity and one-way analysis of variance were used to compare proportions and continuous data, respectively. Multiple linear regression (stepwise method) was used to determine the independent influencing factors of the SEQ-NRC. Variables that stood out as significant in the univariate analysis were included in the regression equation. The significance level was accepted as .05.

Ethical Issues

The research was ethically approved by the SNA Secretary-General. Principles of confidentiality, voluntary participation, and informed consent were applied (World Medical Association, 2013). All participants were informed about the purpose of the study. In addition, participants were explicitly informed that they could withdraw at any time during the survey.

RESULTS
Demographic Characteristics of Participants

As shown in **Table 1**, a total of 2,324 clinical nurses from 17 hospitals participated, and the majority of the respondents were female (2180, 94.6%). The mean age of the respondents was 29.78 ± 6.225, ranging from 19 to 54 years, with 1,522 (65.5%) nurses being younger than 30 years old. The average years of working was 8.09 ± 6.901 (1 to 35 years), and 1,230 (53.2%) nurses have been working for less than 6 years. In terms of professional title, most of the participants had a primary title—nurses (n = 626, 27.1%) and senior nurses (n = 1,055, 45.7%)—and only 74 (3.2%) nurses were associate chief nurses and chief nurses (senior level). Only 151 (6.8%) were head nurses, and 1,160 (50.3%) nurses were in-staff personnel.

The SEQ-NRC

Overall, the mean scores for the SEQ-NRC were lower than 3 on a 5-point Likert scale (mean = 1.89 to 2.89). Of the six dimensions, the nurses perceived higher research capacity in these two dimensions: identifying the research question (mean = 2.2 to 2.77) and literature review (mean = 1.96 to 2.89). However, the scores were low in

TABLE 1			
DEMOGRAPHICS OF THE RESPONDENTS (N = 2,324)			
Variable	n (%)	Mean (SD)	Range
Gender (n = 2,305)			
Male	125 (5.4)		
Female	2,180 (94.6)		
Age (n = 2,323)		29.78 ± 6.225	19 to 54
≤ 25	608 (26.2)		
26 to 30	914 (39.3)		
31 to 35	434 (18.7)		
36 to 40	183 (7.9)		
≥ 41	184 (7.9)		
Years of working (n = 2,313)		8.09 ± 6.901	1 to 35
≤ 3	655 (28.3)		
4 to 6	575 (24.9)		
7 to 10	500 (21.6)		
≥ 11	583 (25.2)		
Education level (initial degree) (n = 2,321)			
Secondary and advanced diploma	1,787 (77)		
Baccalaureate and master's degree	534 (23)		
Education level (highest degree) (n = 2,300)			
Secondary and advanced diploma	831 (36.1)		
Baccalaureate and master's degree	1,469 (63.9)		
Professional title (n = 2,307)			
Nurse or senior nurse	1,681 (72.9)		
Supervisor nurse	552 (23.9)		
Associate chief nurse or chief nurse	74 (3.2)		
Position (n = 2,216)			
Head nurse	151 (6.8)		
Staff nurse	2,065 (93.2)		
Employment mode (n = 2,305)			
In-staff nurses	1,160 (50.3)		
Contract-based and off-staff nurses	1,145 (49.7)		
Department (n = 2,321)			
Emergency department	347 (15)		
Intensive care unit	402 (17.3)		
Operating room	406 (17.5)		
Medical unit	618 (26.6)		
Surgical unit	548 (23.6)		
Scientific research experience (n = 2,074)			
Yes	502 (24.2)		
No	1,572 (75.8)		

two dimensions: research design (mean = 1.89 to 2.06) and data analysis (mean = 1.91 to 2.06) (**Table 2**).

Needs for Training in Nursing Research

Most of the nurses (n = 1,890, 83.1%) expressed the need for scientific research training. The results of the survey showed that the top three needs for research training were academic article writing (n = 1,217, 64.4%), literature retrieval (n = 1,036, 54.8%), and research topic selection (n = 1,032, 54.6%). Items of minimum training requirements were writing application forms (n = 402, 21.3%) and project application information (n = 399, 21.1%) (**Table 3**).

Influencing Factors of the SEQ-NRC

The demographic data of nurses and whether they need research training were used as the independent variables, with the total SEQ-NRC score and subscores of each dimension as dependent variables. Multiple linear regression (stepwise method) was used to determine the influencing factors of SEQ-NRC. Regression analysis showed that many factors might affect the SEQ-NRC scores. For the total score and subscores of most dimensions, such variables as research experience (no versus yes), position (staff nurse versus head nurse), training needs (no versus yes), initial degree (secondary or advanced diploma versus baccalaureate or master's degree), department, employment mode (contract-based or off-staff versus on-staff) were included in the regression equation (**Table 4**).

DISCUSSION
The Scientific Research Capacity of Nurses in China Is Relatively Low

Overall, the mean SEQ-NRC scores were less than 3 on a 5-point scale. In general, the nurses perceived higher research capacity in identification of research questions and literature review, but the scores were low in terms of research design and data analysis, which was consistent with the findings of Akerjordet et al. (2012). The results revealed that the scientific research capacity of nurses in China is relatively low, and obviously lower than those reported by other researchers (Akerjordet et al., 2012; Duffy et al., 2015; Torres et al., 2017). The results are also in line with those of Timmins et al. (2012), who reported that clinical nurses had insufficient support for nursing research and lacked related skills.

For all 30 items, the top three highest scores came from the dimensions of literature review and identification of the research question were searching relevant literature on the Internet, looking for theoretical evidence pertinent to the questions, proposing solutions to the questions. The results indicated that clinical nurses in China have confidence in retrieving literature online and looking for and proposing solutions to questions. However, the results also suggested that literature retrieval ranked second in specific training needs of clinical nurses. This may be because the clinical nurses need professional systematic training to improve the efficiency of literature retrieval. The literature retrieval ability reported by the nurses was similar to that found by Akerjordet at al. (2012), who reported that accessing relevant literature is one of the five highest ranked areas of good research capacity. The lowest scored three items were calculating sample size, choosing qualitative, quantitative, or mixed research methods according to research purpose (under the dimension of research design), and data analysis. The results of the current study were also consistent with those in some foreign reports (Akerjordet et al., 2012), which reported that using computerized statistical packages was difficult for clinical nurses. The results of the survey also revealed that clinical nurses in China have a low degree of participation in scientific research practices.

Clinical Nurses in China Need Training in Nursing Research

Among the participants, 1,890 expressed their need for training in scientific research, accounting for 83.1% of the surveyed population, which means that most nurses expect to improve their scientific research capacity through training in nursing research. The results are also in line with those of Akerjordet et al. (2012) and Timmins et al. (2012), which revealed that clinical nurses lacked research skills and most of them needed different forms of research training. Evidence suggests that providing research training for clinical nurses can improve their research ability (Torres et al., 2017).

Clinical nurses have the maximum demands for academic article writing (n = 1,217, 64.4%), followed by literature retrieval (n = 1,036, 54.8%) and research topic selection (n = 1,032, 54.6%). The demand for information about project application and writing application forms were not high. It is reported that among the research abilities of clinical nurses, article writing and publication showed the greatest potential for enhancement (Torres et al., 2017).

In China, the promotion of clinical nurses requires publishing research articles on clinical nursing practice and holding a position as PI of scientific research projects on clinical nursing (Zhang et al., 2014). Therefore, most clinical nurses in China tend to focus on things directly related to the promotion of their professional title—such as academic article writing—without realizing that in the process of nursing research, research design, and implementation is the primary step whereas academic article writing is the last stage of the process.

TABLE 2

SELF-EVALUATION QUESTIONNAIRE OF NURSING RESEARCH CAPACITY (30 ITEMS)

Items By Dimension	Mean	SD
Total	2.18	0.710
D1: Identification of research question (three items):	2.57	0.770
Q1: Identify researchable questions.	2.20	0.831
Q2: Propose solutions to the questions.	2.75	0.914
Q3: Look for theoretical evidence pertinent to the questions.	2.77	0.918
D2: Literature review (five items):	2.45	0.740
Q4: Look up relevant literature manually.	2.70	0.932
Q5: Search for relevant literature on the Internet.	2.89	0.991
Q6: Proficient in using Chinese databases.	2.57	1.019
Q7: Read English language nursing literature with the help of tools.	1.96	0.894
Q8: Evaluate nursing research reports objectively.	2.13	0.886
D3: Research design (five items):	1.96	0.790
Q9: Calculate sample size.	1.89	0.896
Q10: Determine inclusion criteria.	2.06	0.903
Q11: Specify independent and dependent variables.	1.97	0.891
Q12: Choose qualitative, quantitative, or mixed research methods according to research purpose.	1.90	0.858
Q13: Determine the evaluation standards for research results.	1.97	0.896
D4: Implementation of research (six items):	2.16	0.830
Q14: Prepare a detailed research proposal.	2.00	0.903
Q15: Consider ethical issues.	2.28	0.998
Q16: Identify and consider controlling for confounding variables.	2.26	0.950
Q17: Adjust research plan when research practices are inconsistent with the design.	2.08	0.904
Q18: Skillful observation and documentation of research-relevant information.	2.17	0.930
Q19: Conduct interviews adeptly.	2.16	0.946
D5: Data analysis (five items):	1.99	0.820
Q20: Make commonly used statistical charts.	2.06	0.930
Q21: Make statistical descriptions.	1.98	0.897
Q22: Apply appropriate statistical methods.	1.95	0.882
Q23: Interpret statistical data correctly.	2.03	0.901
Q24: Qualitative data analysis.	1.91	0.870
D6: Academic article writing (six items):	2.15	0.896
Q25: Writing—Introduction	2.12	0.930
Q26: Writing—Abstract	2.14	0.947
Q27: Writing—Keywords	2.18	0.959
Q28: Writing—Results	2.09	0.927
Q29: Writing—Discussion	2.10	0.924
Q30: Writing—References	2.24	1.046

Note. D = dimension; Q = question.

Some Measures May Improve the Scientific Research Capacity of Clinical Nurses

The results from regression analysis showed that the research capacity of nurses who had scientific research experience before was higher than that of nurses who had none. Clinical nurses can improve their scientific research knowledge through training in research and can enhance research capacity through involvement in nursing research and application of knowledge in research practices. However, the results of this study showed that only 502 respondents had scientific research experience, accounting for 24.2% of the total nurses surveyed and, by experience, most of the nurses meant writing or publishing articles (22.3% and 23.8%). Some studies reported low participation in research among clinical nurses (Akerjordet et al., 2012; Moore et al., 2012).

McKee et al. (2017) proposed that clinical nurses had little chance to participate in scientific research. According to Ghader (2015), only 34% of the nurses in the United Arab Emirates were ever involved in research, and 85% perceived themselves to be lacking in basic research skills.

The low degree of research participation of clinical nurses in China has a certain relationship with the application policy of nursing research projects. As reported, increased participation in research can improve scientific research ability (Janssen, Hale, Mirfin-Veitch, & Harland, 2013; Scala et al., 2016; Stewart et al., 2014). In China, the opportunities for clinical nurses to participate in or be the PI of a research project are very few.

Providing funding for nursing research can help clinical nurses improve their research ability (McKee et al., 2017; Moore et al., 2012; Torres et al., 2017). For example, the Nursing, Midwifery, and Allied Health Professionals consortia in Scotland has successfully improved the scientific research ability of the participants (Fyffe, 2006). Funding can also improve the quality of nursing research and help with publishing articles in peer-reviewed journals (McCreaddie et al., 2018). More research funding and research training can increase the participation of clinical nurses in research and improve their nursing research ability (McKee et al., 2017).

Most of the large-scale scientific research funds do not include nursing in their application guidelines, such as the Natural Science Foundation of China and the Provincial Natural Science Foundation. However, this phenomenon is changing for the better. Nursing has become a first-level discipline in China since 2011, and nursing administrators and policy makers have been increasing funding for nursing research projects. Some municipal science and technology bureaus have even begun to make nursing research projects independent of others—

TABLE 3
RESEARCH TRAINING NEEDS, *N* (%)

Item	Yes	No
Research training	1,890 (83.1)	385 (16.9)
Academic article writing	1,217 (64.4)	673 (35.6)
Literature retrieval	1,036 (54.8)	854 (45.2)
Research topic selection	1,032 (54.6)	858 (45.4)
Data analysis	1,015 (53.7)	875 (46.3)
Date collection	906 (47.9)	984 (52.1)
English training	832 (44)	1,058 (56)
Research design	815 (43.1)	1,075 (56.9)
Patent application	428 (22.6)	1,462 (77.4)
Writing application form	402 (21.3)	1,488 (78.7)
Project application information	399 (21.1)	1,491 (78.9)

one example being the Suzhou Science and Technology Bureau—and this progress will bring certain benefits to nursing research and nurses participating in scientific research.

Pursuing a higher initial degree can improve clinical nurses' scientific research capacity. In this study, the initial degree of nurses referred to secondary and advanced diploma (low) and baccalaureate and master's degree (high). The number of nursing students who were admitted to advanced diploma and undergraduate programs showed a rising trend in the past 7 years, whereas the number of students recruited by secondary diploma programs decreased (You et al., 2015), which signifies the advancement of nursing education.

The head nurses scored higher than staff nurses in nursing research capacity. The reason may that a head nurse is a nurse manager in the department, who is selected from clinical nurses and is an outstanding representative of the nurses. Head nurses not only need to have more adept clinical skills and higher theoretical and management levels, but they also need to have a certain professional title and scientific research capacity. Head nurses are more likely to successfully apply for nursing research projects, as they often have certain research funding and thus find it easier for them to obtain relevant project information.

Identifying the research training needs of clinical nurses may be a means to improve their research capacity. Many studies have shown that research training and education for clinical nurses can improve their nursing research ability (Akerjordet et al., 2012; Scala et al., 2016; Stewart et al.,

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INFLUENCING FACTORS OF SELF-EVALUATION QUESTIONNAIRE OF NURSING RESEARCH CAPACITY (SEQ-NRC)

Dependent Variable	R^2	Independent Variable	b	SE	ß	t Value	Significance Level
Total score	0.104	Constant	57.763	1.811		31.894	<0.001
	$F = 11.477$	Research experience (no versus yes)	9.653	1.422	0.194	6.787	<0.001
	$p < .001$	Position (staff nurse versus head nurse)	10.092	2.350	0.112	4.294	<0.001
		Research training needs (no versus yes)	4.488	1.297	0.081	3.459	0.001
		Initial degree (secondary or advanced diploma versus bachelor or master)	6.553	1.254	0.130	5.227	<0.001
		Department (ED versus OR)	5.504	1.722	0.098	3.196	0.001
		Employment mode (off-staff versus in-staff)	-2.165	1.131	-0.050	-1.914	0.056
Identification of research question	0.142	Constant	6.111	0.186		32.907	<0.001
	$F = 18.062$	Research experience (no versus yes)	0.764	0.149	0.144	5.135	<0.001
	$p < .001$	Position (staff nurse versus head nurse)	0.852	0.234	0.089	3.566	<0.001
		Research training needs (no versus yes)	0.572	0.134	0.095	4.259	<0.001
		Highest degree (secondary or advanced diploma versus Bachelor or Master)	0.409	0.121	0.086	3.391	0.001
		Department (ED versus OR)	0.855	0.177	0.141	4.842	<0.001
		Department (ED versus MU)	0.502	0.161	0.097	3.125	0.002
		Department (ED versus SU)	0.542	0.165	0.100	3.288	0.001
Literature review	0.087	Constant	10.896	0.311		35.089	<0.001
	$F = 9.796$	Research experience (no versus yes)	1.393	0.246	0.162	5.671	<0.001
	$p < .001$	Position (staff nurse versus head nurse)	1.172	0.393	0.076	2.979	0.003
		Research training needs (no versus yes)	1.088	0.224	0.112	4.865	<0.001
		Initial degree (Secondary or Advanced diploma versus Bachelor or Master)	1.296	0.215	0.148	6.028	<0.001
		Department (ED versus OR)	0.918	0.296	0.094	3.106	0.002
		Age group (< 25 versus > 40 years)	-1.456	0.708	-0.099	-2.056	0.040
Research design	0.055	Constant	9.571	0.286		33.468	<0.001
	$F = 6.257$	Research experience (no versus yes)	1.430	0.265	0.156	5.407	<0.001
	$p < .001$	Position (staff nurse versus head nurse)	1.571	0.427	0.096	3.678	<0.001
		Initial degree (Secondary or Advanced diploma versus Bachelor or Master)	0.877	0.233	0.094	3.762	<0.001
		Department (ED versus OR)	0.734	0.319	0.071	2.304	0.021
		Employment mode (off-staff versus in-staff)	-0.543	0.211	-0.069	-2.574	0.010

2014). Nurses who need training in scientific research tend to focus on research capacity enhancement, and they also tend to pay more attention to the accumulation of scientific research knowledge and are more actively involved in nursing research. Thus, nurse managers can improve clinical nurses' research capacity by making nurses realize the importance of nursing research and increase clinical nurses' demand for training in nursing research.

In-staff nurses' research capacity was found to be lower than that of contract-basesd or off-staff nurses. At pres-

TABLE 4 (cont'd)

INFLUENCING FACTORS OF SELF-EVALUATION QUESTIONNAIRE OF NURSING RESEARCH CAPACITY (SEQ-NRC)

Dependent Variable	R^2	Independent Variable	b	SE	ß	t Value	Significance Level
Implementation of research	0.061	Constant	11.510	0.424		27.154	<0.001
	$F = 7.059$	Research experience (no versus yes)	1.662	0.337	0.143	4.937	<0.001
	$p < .001$	Position (staff nurse versus head nurse)	2.214	0.542	0.106	4.087	<0.001
		Research training needs (no versus yes)	0.786	0.306	0.060	2.566	0.010
		Initial degree (secondary or advanced diploma versus Bachelor or Master)	0.815	0.294	0.069	2.775	0.006
		Department (ED versus OR)	1.088	0.405	0.082	2.689	0.007
Data analysis	0.045	Constant	9.512	0.294		32.326	0
	$F = 5.100$	Research experience (no versus yes)	0.936	0.273	0.100	3.423	0.001
	$p < .001$	Position (staff nurse versus head nurse)	1.780	0.437	0.106	4.071	0
		Initial degree (secondary or advanced diploma versus bachelor or master)	1.008	0.240	0.105	4.198	0
		Department (ED versus OR)	1.144	0.329	0.106	3.475	0.001
		Employment mode (off-staff versus in-staff)	-0.661	0.218	-0.081	-3.030	0.002
Academic article writing	0.162	Constant	10.85	0.429		25.269	0
	$F = 19.967$	Research experience (no versus yes)	3.135	0.345	0.252	9.097	0
	$p < .001$	Position (staff nurse versus head nurse)	2.213	0.541	0.101	4.089	0
		Research training needs (no versus yes)	0.907	0.310	0.065	2.925	0.003
		Highest degree (secondary or advanced diploma versus bachelor or master)	2.261	0.318	0.203	7.105	0
		Professional title (primary versus highest)	1.936	0.957	0.606	2.022	0.043

Note. ED = emergency department; OR = operating room; MU = medical unit; SU = surgical unit.

ent, the personnel system in China is undergoing reforms, namely from a stable, lifelong job (in-staff) to contract-based employment (off-staff). The number of in-staff nurses will decline and more nurses will be contract based. Coincidentally, more nursing students of a higher initial degree will become clinical nurses, which is good news for upgrading the research capacity of clinical nurses in China.

Compared with nurses who worked in the ED, nurses who worked in the surgical unit and operating room had higher research capacity scores. This may be related to nurses' workload in different departments. As some studies pointed out, nursing staff shortage and heavy workload was one of the barriers to improving nursing research capacity (McCreaddie et al., 2018; Torres et al., 2017). In China, the ED is usually considered as a department with a heavy workload and high labor intensity, so ED nurses tend to have less time and energy to study or conduct nursing research.

Through regression analysis, we found that increasing the participation of clinical nurses in scientific research, upgrading the initial degree of nurses (not only improving the nurses' highest degree through on-the-job education, but also making the nurses realize the importance of nursing research), and explicitly expressing their requirements for nursing research training may be feasible strategies to improve the nurses' scientific research capacity. At the same time, there are differences in research capacity among nurses working in different departments, and research capacity of the ED nurses should be strengthened.

CONCLUSION

Research participation of clinical nurses in China is low, as is self-evaluated research capacity. However, the majority of clinical nurses want to improve their research ability by means of nursing research training. Increasing the participation of clinical nurses in nursing research, upgrad-

ing the initial degree of nurses, and improving the nurse's demand for nursing research training can help to improve the scientific research capacity of clinical nurses.

RELEVANCE TO CLINICAL PRACTICE

Nursing administrators and policy makers should increase funding for nursing scientific research in order to improve the participation of clinical nurses in scientific research. In the meantime, they should provide nurses with more training opportunities in scientific research and perfect the nursing education system so that more nursing students can have access to a higher level of nursing education. Nurse managers should pay attention to the enhancement of research capacity and offer more opportunities to clinical nurses to enhance the quality of nursing research.

LIMITATIONS

One limitation of this research is that the research capacity of the participants (e.g., knowledge, skills, and attitudes and beliefs) is self-reported. Also, the investigation in this study was limited to only one city in eastern China, and the hospitals included were all first-class hospitals, not covering the basic-level hospitals. Therefore, research findings may not effectively represent the research capacity of all clinical nurses in China, and the scope for research needs to be further expanded in the future.

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