Development of Clinical Practice Ability Evaluation Scale for New Nurses and its Reliability and Validity

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ABSTRACT

Objective: To develop the clinical practice ability evaluation scale for new nurses and test its reliability and validity.

Methods: The clinical practice ability prediction test scale of new nurses was formed through literature research, expert meeting, Delphi expert consultation and pre investigation. 578 new nurses were selected by stratified sampling method for investigation and analysis to test the reliability and validity of the scale.

Results: The newly recruited nursing clinical practice ability evaluation scale included 5 dimensions and 45 items; Each item of the new nurses' clinical practice ability evaluation scale has a good differentiation, and the total correlation of each item is 0.437~0.697; Confirmatory factor analysis showed that the model fitting index was good (2/df=1.035, RMSEA=0.008, GFI=0.932, AGFI=0.925, CFI=0.998, TLI=0.998, SRMR=0.028); The calibration correlation validity was 0.831; Content validity: S-CVI=0.93, I-CVI=0.833~1.000; The internal consistency of the scale is fine, the correlation coefficient between the total score of each dimension and the total score of the scale is 0.583~0.861, and the correlation coefficient between the dimensions of the scale is 0.262~0.362; Overall Cronbach's of the scale is 0.946, and the split half reliability is 0.682.

Conclusion: The clinical practice ability evaluation scale for new nurses has good reliability and validity, which can be used as an effective tool to evaluate the clinical practice ability of new nurses.

Key Words: Nurse; Clinical practice ability; Reliability; Validity

INTRODUCTION

The Outline of the "Healthy China 2030" Plan proposes that by 2030, China will have 4.7 registered nurses per 1000 permanent residents [1]. According to the Statistical Bulletin of National Economic and Social Development in 2021 released by the National Bureau of Statistics in February 2022, there are 5.02 million registered nurses in China, with 3.5 registered nurses per 1000 people, and 3 million more nurses are needed [2]. The supply of new nurses plays an important role in maintaining the stability of the nursing human resource team, and the quality of new nurses' skills is related to the safety of patients, and

also reflects the smooth transition from graduates to clinical nurses [3]. Therefore, it is of great significance to evaluate the clinical practice ability of newly recruited nurses and improve their pertinence. At present, the evaluation of clinical competence of nursing staff is mostly based on competency and core competence, and most of them are senior nursing staff. Most of the research focuses on emergency, operating room, newborn and other specialized fields [4,5]. For example, if the evaluation scale of core competence or competency that has been formed is used, it does not conform to the characteristics of new nurses, and it is unable to evaluate the real ability of new

nurses [3]. Therefore, the purpose of this study is to build a scientific and practical evaluation scale for the clinical practice ability of new nurses, to achieve an all-round evaluation of new nurses, to provide a reference for the training and training of new nurses, to promote new nurses to better and faster adapt to the role of nurses, and to lay a foundation for the effective improvement of nursing service quality.

MATERIALS AND METHODS

Preparation of the Scale

An item pool was formed to retrieve databases such as CNKI, Wanfang, PubMed, Web of Science, and CINAHL. The Chinese search terms are "newly recruited," "nurse," "clinical practice ability," "core competence," and "core competence;" In addition, drawing on the already formed scales "China Registered Nurse Core Competency Scale," "Nurse Competency Scale" and "Admission Level Nurse Questionnaire," forming the original item pool; Through two expert meetings, the original item pool was revised to form a draft scale with 6 dimensions and 57 items, and an expert consultation questionnaire was formed [6-8]. Delphi expert consultation selects experts in clinical nursing, nursing management, nursing education, social psychology, health statistics and other fields covering the eastern, central and western regions of China. Criteria for inclusion of experts:

- Education background: Bachelor degree or above;

- Professional title: Deputy Senior or above;

- Working years in the existing work field ≥ 10 years;

- Informed consent.

The experts use the Likert 5 level scoring method to score the importance of the items, and assign values from "very unimportant" to "very important" [9]. The index shall be selected according to the importance assigned value mean>4 and coefficient of variation (CV)<0.2. The final evaluation index shall be determined through discussion of the research group in combination with expert opinions. Pre survey In April 2021, Hebei Province, Jilin Province and Gansu Province were selected for the pre survey of small samples by the convenient sampling method, and 30 samples were selected from each province.

Inclusion criteria: Graduates of secondary vocational and higher vocational nursing major who passed the nursing qualification examination in 2020 and are employed in tertiary hospitals, secondary hospitals and primary medical institution. Those who have not interrupted their work in clinical nursing post since graduation.

Rejection criteria: Those who give up in the process of answering. All entries have the same answer. During the investigation, record whether the respondents question the items or have difficulties in understanding them, and revise them through the discussion of the expert meeting and the research group.

Reliability and Validity Test

From July to August 2021, according to the level of economic development and regional characteristics, 2 to 3 provinces (municipalities directly under the Central Government or autonomous regions) in the east, middle and west of China were randomly selected by multi-stage stratified random sampling method, including Jiangsu Province, Jilin Province, Gansu Province, Hubei Province, Hebei Province and Chongqing City. Inclusion criteria and exclusion criteria are the same as those of pre investigation. The calculation of sample size is based on 5-10 times of the items. There are 45 items in this scale. According to the 10% loss rate, at least 248 cases are included, and 578 cases are actually included.

Survey tool: General information survey scale: Including department, gender, education background, specialty, independent duty, etc. Investigation scale of clinical practice ability of newly recruited nurses: This scale is a self-assessment scale with 5 dimensions and 45 entries. It adopts Likert 5-grade scoring method, and 1 point=cannot be completed; 2=completed under the guidance of teachers; 3=completed with the help of colleagues; 4=can be completed independently; 5=can guide junior nurses to complete. The total score of the questionnaire is 45-225. The higher the score, the stronger the clinical practice ability.

Data Collection Method

Questionnaire stars were used to complete the questionnaire survey. In order to ensure the quality of the questionnaire recovery, members of the research team set up quality control related settings in the background of the questionnaire stars, such as: Set up unified guidelines in the questionnaire; The minimum submission time is set for each questionnaire; The questionnaire must be completed, otherwise it cannot be submitted.

Statistical Methods

SPSS21.0 and AMO21.0 software were used for analysis. Quantitative data were expressed by mean ± standard deviation; Qualitative data are expressed in frequency and percentage. The items were screened by correlation coefficient method, internal consistency analysis and factor analysis. Exploratory factor analysis, confirmatory factor analysis and content validity index were used to evaluate the validity; Cronbach's α coefficient and Spearman Brown coefficient were used to evaluate the reliability. $P<0.05$ indicates that the difference is statistically significant.

RESULTS

Delphi Expert Consultation Results

A total of 19 experts, aged 41-60 years, were included; 16 (84%) with more than 20 years of service; Education background: 3 undergraduates (16%), 10 masters (53%), 6 doctors (31%); 16 (84%) of them are senior leaders and 3 (16%) are deputy senior leaders; There were 3 clinical nursing workers (16%), 7 nursing educators (37%), 5 nursing managers (26%), 3 social psychologists (16%), and 1 health statistician (5%). The positive coefficients of the two rounds of expert consultation are 100% and 95%, the authoritative coefficients are 0.888 and 0.892, and the Kendall coordination coefficients are 0.238 and 0.265. After two rounds of expert consultation, 1 primary indicator and 12 secondary indicators were deleted; Modify 2 primary indicators and 28 secondary indicators; Consolidate 6 secondary indicators; Add 3 secondary indicators. The final scale consists

of 5 dimensions and 45 items.

Pre Survey Results

The pre survey did not delete dimensions and items, but only revised the description of items. "Have professional quality, love your job and be dedicated to your work" is revised to "be able to be cautious and independent in your work, love your job and be dedicated to your work."

Formal Findings

Project differentiation analysis: All items in this study are not binary scoring questions, so the Pearson product difference correlation coefficient between the score of each item and the total score of the scale is used as the index to evaluate the project differentiation (**Table 1**).

Table 1: Project differentiation

Item	Criteria Value	Correlation Coefficient with Total score	Item	Criteria Value	Correlation Coefficient with Total Score
1. Ability to evaluate the physical, psychological and social aspects of the patient	-19.05	.691**	Ability to evaluate the effect of patient health education	-10.119	.439**
2. Ability to make a nursing plan according to the patient's specific situation.	-18.646	.697**	Ability to use appropriate communication skills to solve nursing problems	-11.571	.481**
3. Ability to carefully observe and record the patient's progress	-18.424	.696**	Ability to communicate effectively with healthcare team members	-11.335	.457**
4. Ability to handle and follow doctor's orders correctly	-17.475	.664**	Ability to actively communicate with patients and their families effectively	-12.477	.469**
5. Ability to correctly collect test samples (blood, urine, stool, sputum, etc.)	-16.131	.642**	Ability to communicate effectively with other supporting nursing staff (e.g. carers, support staff, etc.)	-10.329	.450**
6. Ability to take measures to deal with/prevent adverse reactions/complications of patients during treatment	-18.737	.676**	Ability to work with team members to solve common clinical medical care problems	-11.282	.468**
7. Ability to accurately implement the system of verifying from three aspects and checking from eight aspects	-15.009	.612**	Ability to perform nurse duties in accordance with laws and regulations (e.g., nurses' regulations, etc.)	-11.922	.479**
8. Ability to provide perioperative care to patients (ignore this item for nurses in non-surgical departments)	-19.919	.687**	Ability to carry out nursing practice activities according to nursing practice standards (such as clinical nursing practice guidelines, technical specifications for intravenous infusion, nursing grading, etc.)	-11.045	.461**
9. Ability to assess patients prior to medication (e.g., lab results, history of allergic reactions, etc.)	-17.923	.658**	Ability to follow the rules and regulations of the hospital to carry out nursing work (e.g., nurse responsibilities, nursing workflow, etc.)	-10.992	.437**
10. Ability to use the correct way of medication	-15.347	.628**	Ability to report specific incidents as required (e.g., infectious diseases, injuries involving possible criminal matters, drug use, poisoning, etc.)	-11.476	.480**
11. Ability to observe and record drug usage and patient reaction	-18.657	.673**	Ability to report nursing adverse events in time	-11.593	.462**
12. Ability to perform first aid procedures (e.g., CPR)	-17.907	.682**	Ability to assess common patient safety issues and influencing factors	-11.507	.489**
13. Ability to provide nursing measures for patients with common psychological problems	-18.512	.683**	Ability to take necessary measures to ensure patient safety	-11.39	.486**
14. Ability to perform the necessary procedures for admission, transfer and discharge	-19.057	.672**	Ability to love the motherland and set the right professional values	-10.625	.458**
15. Ability to complete the transition task	-19.026	.680**	Ability to have the quality of being cautious when alone at work and the spirit of love and dedication to work".	-9.578	.408**

16. Ability to apply the information technology commonly used in clinical nursing	-16.488	.646**	Ability to respect patients' privacy and maintain the confidentiality of medical and nursing data	-11.204	.473**
17. Ability to write the paperwork properly (such as nursing records, etc.)	-17.62	.670**	Ability to understand patients and their families and respect their rights to make their own choices and decisions	-10.31	.436**
18. Ability to assess patients' needs of health education	-12.238	.485**	Ability to provide care services on the basis of informed consent	-10.788	.466**
19. Ability to conduct health education for different patients	-12.872	.485**	Ability to tend the patients with love, carefully and patiently with humanistic care attitude	-11.157	.478**
20. Ability to provide health guidance for the whole process from admission to discharge	-12.629	.514**	Ability to adapt to the role of nurse, cope with stress at work and carry out self-mental health care	-11.81	.500**
21. Ability to use network, multimedia and other means to implement health education for patients	-13.025	.490**	Ability to have the awareness and ability of active learning and lifelong learning	-11.335	.482**
22 Ability to provide health guidance to the patient's primary caregivers	-9.811	.442**	Ability to make career planning according to their own characteristics	-9.957	.408**
23. Ability to accurately record the process of health education	-11.979	.466**			

Construct Validity Analysis

Exploratory factor analysis: Exploratory factor analysis showed that the KMO value was 0.963, the Bartlett spherical test value was 15219.956, the degree of freedom (df)=990, P<0.001, which was suitable for factor analysis. According to the five dimensions of clinical practice ability and the judgment of lithotripsy chart (**Figure 1**), 5 factors with characteristic roots>1 were selected, and the cumulative variance contribution rate was 60.959% (**Table 2**).

Table 2: Results of exploratory factor analysis

Item	Component				
	Clinical nursing practice ability	Health education ability	Communication and cooperation ability	Ensuring patient safety	Professional quality
1. Be able to evaluate the physiological, psychological and social aspects of the patient	0.731				
2. Able to formulate a nursing plan according to the specific situation of the patient	0.759				
3. Be able to carefully observe and record the patient's progress	0.761				
4. Able to correctly handle and execute medical orders	0.769				
5. Able to correctly collect inspection samples (blood, urine, stool, sputum, etc.)	0.728				
6. Be able to take measures to deal with/prevent adverse reactions/complications of patients during treatment	0.746				
7. Able to accurately implement the system of three checks and eight pairs	0.741				
8. Able to provide perioperative care for patients (nurses in non operating departments ignore this item)	0.778				
9. Be able to evaluate the patient before use (such as laboratory results, allergic reaction history, etc.)	0.752				
10. Able to use the correct way of administration	0.709				
11. Able to observe and record medication and patient reaction	0.763				
12. Able to perform emergency rescue procedures (such as cardiopulmonary resuscitation)	0.734				
13. Able to provide nursing measures for patients with common psychological problems	0.778				
14. Able to execute the necessary procedures for admission, transfer and discharge	0.791				
15. Able to complete shift handover tasks	0.754				

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16. Be able to apply commonly used clinical information means	0.763			
17. Able to write nursing documents in a standardized way (such as nursing record sheet)	0.764			
18. Be able to assess patients' health education needs		0.741		
19. Able to carry out health education for different patients		0.723		
20. Able to provide health guidance from admission to discharge		0.761		
21. Be able to apply network, multimedia and other means to implement health education for patients		0.731		
22. Able to give health guidance to the patient's main caregivers		0.716		
23. Able to accurately record the health education process		0.704		
24. Be able to evaluate the effect of health education for patients		0.756		
25. Able to adopt appropriate communication skills to solve problems in the nursing process			0.721	
26. Able to communicate effectively with medical team members			0.769	
27. Able to actively communicate with patients and their families			0.771	
28. Able to communicate effectively with other nursing support personnel (such as nursing workers, logistics personnel, etc.)			0.766	
29. Able to work with team members to solve common clinical medical and nursing problems			0.736	
30. Able to perform nurse duties according to laws and regulations (such as nurse regulations)				0.745
31. Able to carry out nursing practice activities according to the standards of nursing practice specifications (such as clinical nursing practice guidelines, technical specifications for intravenous infusion, nursing grading, etc.)				0.740
32. Able to carry out nursing work in accordance with the rules and regulations of the hospital (such as nurses' job responsibilities, nursing workflow, etc.)				0.730
33. Be able to report specific events as required (such as infectious diseases, injuries that may involve criminal problems, drug abuse, poisoning, etc.)				0.783
34. Able to report nursing adverse events in time				0.761
35. Be able to assess common safety problems and influencing factors of patients				0.710
36. Be able to take necessary measures to ensure patient safety				0.761
37. Able to love the motherland and establish correct professional values				0.718
38. Be able to be cautious and independent in work, love the post and be dedicated to work				0.736
39. Be able to respect the privacy of patients and maintain the confidentiality of medical and nursing data				0.753
40. Be able to understand patients and their families, and respect their right to self-choice and decision				0.781
41. Able to provide nursing services on the basis of informed consent				0.758
42. Able to carry out nursing with caring, careful and patient humanistic care attitude				0.720
43. Able to adapt to the role of nurses, cope with stress in work and carry out self-psychological health care				0.755
44. Have the awareness and ability of active learning and lifelong learning				0.781
45. Able to make career planning according to their own characteristics				0.774
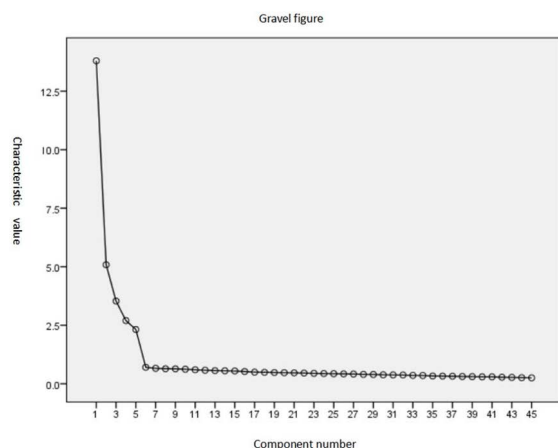
Figure 1: Five dimensions of clinical practice ability and the judgment of lithotripsy chart

Confirmatory factor analysis: The maximum likelihood method is used to verify the consistency of the model. The results showed that the ratio of chi square of goodness of fit to degrees of freedom $(c2/df)=1.035$, root mean square of approximation error $(RMSEA)=0.008$, goodness of fit index $(GFI)=0.932$, adjusted goodness of fit index $(AGFI)=0.925$, comparative fit index $(CFI)=0.998$, irregular quasi fit index $(TLI)=0.998$, and standardized root mean square residual $(SRMR)=0.028$.

Calibration related validity: Calibration related validity is to use the existing authoritative scale as the criterion to measure its correlation with the newly prepared scale. The greater the correlation, the better the validity of the new scale [10]. At present, there is no authoritative clinical practice ability evaluation scale for new nurses. Therefore, this study takes the self-evaluation of the research object as the calibration standard, and the statistical results show that the correlation validity of the calibration standard is 0.831.

Content validity: According to the expert evaluation results, there are 42 items with all expert scores ≥ 3, S-CVI=42/45=0.93; the content validity index (I-CVI) of each item level was 0.833~1.000.

Internal consistency of the scale: The correlation coefficient between the total score of each dimension and the total score of the scale is 0.583~0.861, and the correlation coefficient between the dimensions of the scale is 0.262~0.362, which is statistically significant (**Table 3**).

Table 3: Correlation analysis between dimensions and total amount table (r value)

Item	Health education ability	Communication and cooperation ability	Ensuring patient safety	Professional quality	Total amount table
Clinical nursing practice ability	0.350**	0.362**	0.303**	0.317**	0.861**
Health education ability		0.320**	0.345**	0.262**	0.620**
Communication and cooperation ability			0.321**	0.314**	0.583**
Ensuring patient safety				0.343**	0.602**
Professional quality					0.585**

Reliability analysis of the scale: The overall Cronbach's α of the scale was 0.946, and the split half reliability was 0.682; Cronbach's α of clinical nursing practice ability was 0.958, and the half reliability was 0.960; Cronbach's α of health education ability was 0.883, and the half reliability was 0.881; Cronbach's α of communication and cooperation ability is 0.857, and the split half reliability is 0.851; Cronbach ' s α was 0.893, and the half reliability was 0.895; The Cronbach's α of professional quality is 0.919, and the half reliability is 0.918.

DISCUSSION

The clinical practice ability evaluation scale of new nurses meets the needs of the times. The knowledge and skills of newly recruited nurses cannot fully meet the actual clinical work needs, and they often face problems such as "insufficient professional knowledge reserves, unskilled skill operation, lack of disease observation ability and emergency response ability, poor interpersonal communication ability, and occupational identity problems" [11-13]. To improve the clinical ability of newly recruited nurses and successfully complete the transition from nursing students to licensed nurses is an important topic of current nursing talent training. An effective training program should be based on a comprehensive, in-depth and objective evaluation. The evaluation scale formed in this study provides an objective quantitative tool for the evaluation of new nurses' clinical practice ability [14,15]. Moreover, in the process of constructing the scale, the practicability and measurability of the items are emphasized, and the following aspects are considered:

- The items are comprehensive and specific, covering clinical work;

- Meet the characteristics and ability needs of new nurses;

- In combination with the Training Program for New Nurses issued by the General Office of the National Health and Family Planning Commission, the scale is divided into five dimensions: Clinical nurses' practical ability, health education ability, communication and cooperation ability, patient safety assurance ability, and professional quality, which meet the job needs of nursing staff in the new era P [16]. Through effective evaluation, it can provide a theoretical basis for medical colleges and universities to deepen education and teaching reform and develop a student training model based on post competency; it will lay a foundation for the hospital to develop a training system for new nurses based on evaluation, demand orientation and job competency [17].

The development of clinical practice ability evaluation scale for new nurses. The first draft of this scale is based on a large number of literature researches, drawing on the mature scale and two expert meetings. The experts selected in Delphi expert consultation cover the east, middle and west regions of China, which are respectively clinical nursing, nursing management, nursing education, social psychology, health statistics and other fields. They are familiar with the content of this study and have strong theoretical basis and practical experience. The expert consultation has high enthusiasm, strong authority and good coordination. At the same time, multiple item analysis method is adopted to screen indicators, and the data analysis is reasonable to effectively ensure the scientificity and preciseness of the scale. The reliability and validity of the clinical practice ability evaluation scale for new nurses are good. This study shows that the scale has good discrimination, and the correlation between each item and the total score of the scale is 0.437~0.697, which indicates that the scale has strong discrimination ability and can accurately measure the clinical practice ability of new nurses; In this study, exploratory factor analysis was used to test the construct validity of the scale. The results showed that the cumulative variance contribution rate of the 5 factors was 60.959%. On this basis, the model was verified by confirmatory factor analysis, and each fitting index was within the standard range, which showed that the factor structure model of the scale was well matched with the data, and the model was more reasonable. Moreover, the correlation coefficient between the total score of each dimension and the total score of the scale is 0.583~0.861, indicating that the internal consistency of the questionnaire is ideal [18]. The results showed that the content validity index of each item was 0.833~1.000, indicating that the content validity of the scale was good, and the dimensions and items of the scale could effectively reflect the clinical practice ability of new nurses; In this study, Cronbach's α coefficient and split half reliability were used to evaluate the reliability of the scale. The Cronbach's α coefficient and split half reliability of the scale as a whole and each dimension were at a high level, indicating that the internal consistency of the scale was good and it had certain stability.

DECLARATIONS

Ethical Approval

This study is the construction of the evaluation scale, which was approved by the Ethics Committee of Chengde Nursing Vocational College when conducting a large sample survey.

Competing Interests

This study does not involve the issue of competitive advantage.

AUTHOR'S CONTRIBUTIONS

Shan Weiying designed the whole research and drafted the first draft of the paper; Ning Yanjiao was responsible for data collection and writing the paper; Feng Yajing was responsible for data analysis; Shan Weichao guided the research design and implementation. All authors agree with the conclusion of the paper and agree to submit to Health and Quality of Life Outcomes.

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AVAILABILITY OF DATA AND MATERIALS

The data of this study are collected by the researchers themselves, which are true and reliable.

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