Research on the Construction of Nurses' Core Competence Knowledge Network Based on Computer Mind Mapping

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Abstract. The core competence of nurses has become the main basis for evaluating the performance of nursing work, which is of great significance in the improvement of nurses' personal quality and the development of nursing profession. This study constructed a core competency evaluation index system based on computer mind maps. After two rounds of index modification, four first-level indicators of theoretical knowledge, professional skills, related abilities, and professional traits were determined, which enriched the structure and evaluation of the core competence elements of nurses. Standard research makes the research results more objective. The results show that the constructed index system is scientific, reliable and highly credible. It has certain practical significance for the training, selection and assessment of registered nurses.

Keywords: Computer Mind Map, Core Competence, Evaluation Index System, Nurse Core Competence Knowledge

1. Introduction

With the continuous improvement of my country's medical and health system, the number of nurses is also increasing. How to ensure the quality of nursing and assess the work of nurses has become the most difficult point of the research. The core competence of nurses, as the main basis for assessing the performance of nursing work, is of great significance in the improvement of nurses' personal qualities and the development of nursing professions [1, 2]. On the one hand, the cultivation of the core competence of nurses has a great role in optimizing the personal abilities of nurses, improving the level of emergency response, and enhancing the sense of professional achievement; on the other hand, it can provide standards and standards for nurses' admission, certification, and talent assessment. Basis, to provide direction and basis for nursing manpower management and policy formulation [3].

The improvement of the core competence of nurses contributes to the overall and sustainable development of nurses and their nursing career [4]. The correct evaluation of the core competence of nurses plays a major role in promoting the development of the nursing profession. How to combine the theoretical framework, measurement tools and training methods of the core competence of nurses to develop a feasible evaluation system and train clinical nurses reasonably according to their professional characteristics to make them have The ability to work in line with clinical requirements has become an important topic facing nursing researchers [5, 6]. Compared with other professions, the
professionalism, complexity, and uncertainty of cardiovascular medical care services are more prominent. Therefore, the high risk of nursing work determines that clinical nurses are more needed, and new diagnosis and treatment techniques have gradually become treatments. An important method for cardiovascular patients.

This research builds a core competence evaluation index system based on computer mind maps, which aims to enrich the research on the core competence element structure and evaluation criteria of nurses, and make the research results more objective.

2. Mind mapping method

2.1. Expert pre-investigation
In order to ensure the quality of the consultation questionnaire, 8 experts from 3 tertiary A hospitals were selected for consultation in December 2018. The experts' work areas include cardiovascular clinical nursing, nursing education, and nursing management. The consultation content includes: whether the indicators are reasonable, whether the words are standardized, whether the table settings meet the requirements of later data processing, and modify according to the opinions of experts, and form a formal expert letter inquiry form for the core competence evaluation index system of cardiovascular specialist nurses.

2.2. Use mind maps to investigate
Computer software commonly used software for drawing mind maps includes Inspiration, MindManager, MindMaster, iMindMap, etc. These softwares are easy to learn, and students can master them with a little practice. In the process of carrying out the core competence knowledge teaching of mind mapping, nurses need to carefully study the content of the textbook, make a choice between the teaching content of each chapter, distinguish the master content and understand the content; thoroughly analyze the knowledge points of each chapter, grasp and determine the teaching of each chapter. The important and difficult points, teaching goals, and teaching methods of the curriculum; construct the hierarchy and logical relationship diagram between chapters to form the prototype of the curriculum knowledge system.

The first lesson of the course. A brief introduction to the use of mind maps and software. Nurses use the curriculum knowledge system structure diagram they have constructed to make themselves clear about the curriculum knowledge system structure, the relationship between chapters and chapters, the important and difficult chapters, and the purpose of setting the chapter. Through guided narration, nurses try to use software to construct a mind map between the course chapters and form a clear understanding of the course.

For specific chapters, the teaching process is constructed with the "four lessons" link, and the teaching design is carried out around the four stages of pre-class, in-class, end-of-class, and after-class.

Design before class. The nurses carefully review the contents of this chapter, which ones are self-study as nurses, and which ones need to be supplemented which are not in the textbook; determine the teaching objectives of this chapter, key and difficult teaching resources, and extract knowledge points and keywords to form a mind map of the knowledge system of this chapter. Complete the guide production of the previous lesson, arrange the course preview according to your own time, and you can construct the mind map of this chapter if you have time.

Design in class. Divided into three stages according to class time. First of all, arrange time for nurses to preview the content of this chapter by themselves, guide nurses to learn to extract keywords, and at the same time form a complement of new and old knowledge to construct a knowledge map for this lesson. Secondly, select the excellent mind map made by the nurse in the last lesson or your own map to review the content of the previous lesson. On the one hand, it shows the characteristics of the excellent map, and on the other hand, conducts knowledge review and introduces a new lesson. What are the teaching goals, important and difficult points in the class? Finally, in the process of explaining specific knowledge points, you can guide nurses to re-understand the knowledge points by setting
teaching questions; you can also let the nurses tell their cognition of the knowledge points. Through the construction of knowledge, students sort out the knowledge system structure of Mujie class and complete the mind map production of this class.

End of class design. In the last period of classroom teaching, the nurses formed a complete knowledge system structure for this lesson, supplemented and counseled the important and difficult points, summarized the teaching content of this lesson, summarized and reflected, and guided students to summarize the knowledge points and knowledge system structure of this lesson.

Design after class. Collect mind maps made by nurses and organize the content that is not easy for nurses in this lesson into brief questions or essay questions. The nurse perfected the mind map again, completed homework after class and submitted it to the teacher.

![Diagram](image)

**Figure 1.** The core competence framework of nurses.

In this study, the expert consultation form was distributed and retrieved in person or by e-mail, and the expert was required to reply within 2 weeks. After the first round of consultation is completed, some items will be modified and deleted based on the opinions of experts. If the mean of the index is \( \geq 3.5 \), the coefficient of variation \( \leq 0.25 \), and the expert approval rate is \( \geq 70\% \), the index will be retained. After revising the results of the first round of consultation, the second round of expert consultation form was formed, and the second expert consultation was conducted.

### 2.3. Data processing

Use SPSS18.0 for data analysis. Use descriptive statistics to analyze the general data of experts. By calculating the mean, standard deviation, coefficient of variation, and expert approval rate of each indicator, the indicators are screened, and the expert positive coefficient, authority coefficient, and coordination are calculated. The coefficient analyzes the reliability of the experts, and conducts the significance test of the expert coordination coefficient, uses the optimal sequence chart method to set
the index weight, and uses Cronbach's $\alpha$ coefficient to test the reliability of the index.

3. Results

3.1. Basic situation of experts (see Table 1)

Table 1. Basic situation of experts (n=24).

| Project          | Number of people | Percentage% |
|------------------|------------------|-------------|
| Age              |                  |             |
| ≤40 years old    | 6                | 25.0        |
| 41 years old~    | 14               | 58.2        |
| ≥50 years old    | 4                | 16.8        |
| Working years    |                  |             |
| ≤10 years        | 2                | 8.4         |
| 11 years~        | 2                | 8.4         |
| ≥20 years        | 20               | 83.2        |
| Education        |                  |             |
| Undergraduate    | 13               | 54.3        |
| Master student   | 7                | 29.1        |
| PhD student      | 4                | 16.7        |
| Intermediate     | 5                | 20.8        |
| Job title        |                  |             |
| Deputy Senior    | 8                | 33.3        |
| Positive         | 11               | 45.8        |

3.2. The enthusiasm of experts
The enthusiasm of experts is expressed by the efficiency of recycling expert questionnaires. In the first and second rounds, 28 and 26 questionnaires were distributed, 26 and 24 valid questionnaires were returned, and the effective response rates were 93% and 92%, respectively. In the two rounds of questionnaire consultation, experts discussed and communicated with researchers via email or telephone. 13 of them proposed amendments, indicating that experts are more enthusiastic about the research.

3.3. Expert authority
The degree of authority of an expert indicates the credibility of the consultation, and the degree of authority of an expert $\geq 0.7$ is considered to have a good degree of credibility. The authority coefficient (Cr) is generally determined by the expert's judgment coefficient (Ca) and the expert's familiarity with the content (Cs). In the two rounds of consultation, through expert self-evaluation, it was calculated that Ca was 0.95, Cs was 0.85, and Cr=(Ca+Cs)/2 was 0.90. It can be seen that the experts in this consultation have high authority and reliable results.

3.4. The degree of coordination of expert opinions
The degree of coordination of expert opinions is expressed by the coordination coefficient (Kendall's W). The score range of the coordination coefficient is 0–1. The higher the score, the higher the degree of coordination and the closer the experts' opinions are. In this study, the expert's internal consistency coefficient Cronbach's $\alpha$ is 0.948, indicating that the reliability of this study is good.

3.5. Establish an evaluation index system for the core competence of cardiovascular specialist nurses
After two rounds of expert consultation, we sorted out and established an evaluation index system for the core competence of cardiovascular specialist nurses, including 4 first-level indicators and 25 second-level indicators. After inspection, the Cronbach's $\alpha$ of the total scale is 0.948, and the $\alpha$ coefficients of various indexes are 0.672–0.941. Details are shown in Table 2.
Table 2. Cardiovascular specialist nurses’ core competence evaluation secondary indicators and weights.

| Index | Mean ± standard deviation | Coefficient of Variation | Weights |
|-------|---------------------------|--------------------------|---------|
| Theoretical knowledge | | | |
| Anatomy knowledge | 3.96±0.64 | 0.158 | 0.116 |
| Physiological knowledge | 4.13±0.73 | 0.180 | 0.121 |
| Pharmacology knowledge | 4.25±0.72 | 0.173 | 0.126 |
| Knowledge of common cardiovascular diseases | 4.79±0.56 | 0.106 | 0.140 |
| Cardiovascular emergency and critical illness related knowledge | 4.92±0.43 | 0.083 | 0.144 |
| Physiological knowledge | 4.67±0.56 | 0.121 | 0.136 |
| Pharmacology knowledge | 3.71±0.52 | 0.148 | 0.111 |
| Knowledge of common cardiovascular diseases | 3.58±0.63 | 0.183 | 0.106 |
| Imaging and laboratory examination knowledge | 4.92±0.45 | 0.083 | 0.253 |
| Pathophysiology knowledge | 4.75±0.55 | 0.112 | 0.244 |
| Observation and evaluation ability | 4.92±0.47 | 0.083 | 0.253 |
| Professional skill | | | |
| Critical Care Capacity | 4.88±0.42 | 0.092 | 0.250 |
| Communication skills | 4.63±0.59 | 0.124 | 0.160 |
| Cooperation and coordination ability | 4.46±0.64 | 0.148 | 0.153 |
| Educational research ability | 3.96±0.61 | 0.158 | 0.137 |
| Professional growth | 4.00±0.58 | 0.148 | 0.138 |
| Clerical recordability | 4.00±0.81 | 0.221 | 0.137 |
| Health promotion and disease prevention | 3.92±0.64 | 0.167 | 0.135 |
| Psychological nursing ability | 4.04±0.73 | 0.186 | 0.140 |
| Professional traits | | | |
| Professional identity | 4.13±0.67 | 0.165 | 0.155 |
| Sense of responsibility | 4.83±0.45 | 0.100 | 0.182 |
| adaptability | 4.29±0.61 | 0.146 | 0.162 |
| empathy | 4.00±0.73 | 0.181 | 0.151 |
| Independent thinking | 4.58±0.56 | 0.128 | 0.173 |
| Shendu spirit | 4.71±0.54 | 0.177 | 0.177 |

4. Discussion

4.1. Reliability analysis of the core competence evaluation index system for nurses in cardiovascular specialty
The positive coefficient of experts in this study is 0.93, 0.92, the judgment coefficient of experts is 0.95, and the familiarity is 0.85. These indicators all indicate that the experts are highly motivated for this research; the degree of authority of experts is 0.90, indicating that the experts have high authority; Coefficient of variation = standard deviation/mean. The smaller the coefficient of variation, the more
consistent the opinions of experts. The coefficient of variation of the indicators in this study is within the acceptable range, and the coordination coefficient of the overall indicator is 0.482 (P<0.01); The test shows that the Cronbach’s α of the total scale is 0.948, and the α coefficients of all levels of indicators are 0.672–0.941, indicating that the opinions of experts on the indicators tend to be consistent, the degree of recognition is high, the evaluation indicator system has good reliability, and the constructed indicator system is reliable.

4.2. The content of the core competence evaluation index system for cardiovascular specialist nurses

In this study, through the computer mind mapping method, a total of 1 first-level indicators, 5 second-level indicators were modified, 3 second-level indicators were deleted, 4 second-level indicators were added, and 4 first-level indicators and 25 were finally constructed. The core competence evaluation index system of cardiovascular specialist nurses composed of secondary indicators. Among the four first-level indicators, the indicators with the highest average and weight values are theoretical knowledge and professional skills, respectively. The average of theoretical knowledge is 4.92 ± 0.28, including knowledge of anatomy, physiology, pharmacology, knowledge of common cardiovascular diseases, knowledge of cardiovascular emergency and critical illness, cardiovascular diagnosis and treatment technology and nursing, imaging and laboratory The 8 aspects of examination knowledge and pathophysiology knowledge show that experts believe that theoretical knowledge is the most basic and most important core competence that cardiovascular specialist nurses should possess. Systematic theoretical knowledge is the basis for the implementation of professional practice. In the secondary indicators, knowledge of common cardiovascular diseases and knowledge of cardiovascular emergency and critical diseases occupy a significant amount of power. On the one hand, cardiovascular patients have complex conditions and require nurses to master Firm knowledge can make timely and accurate assessments of the patient’s condition; on the other hand, cardiovascular patients often have various chronic diseases and complications. Specialist nurses must not only use professional knowledge to identify in time, and take relevant nursing measures, but also Instruct patients and provide relevant health education to patients.

Given a set of indicators \( I = \{i_1, i_2, \cdots, i_n\} \), a weight \( w(i_j) \) is assigned to each page \( i_j \), which is used to indicate that the importance of page access is different. The weight calculation formula is as follows:

\[
w(i_j) = \frac{A Time(i_j)}{\sum A Time(i_j)}
\]  \hspace{1cm} (1)

Among them: \( A Time(i_j) \) is the average access time of indicator \( i_j \); \( \sum A Time(i_j) \) is the sum of the average access time of all indicators; \( 0 \leq w(i_j) \leq 1, \forall j \in \{1,2,\cdots, n\} \).

Professional skills include observation and evaluation capabilities, specialized operation capabilities, emergency treatment and rescue capabilities, and critical care capabilities. The coefficient of variation of these experts is small, indicating that the experts agree that clinical professional skills are necessary for every cardiovascular specialist nurse Core competence. Proficiency in relevant professional skills and providing patients with high-level care have a positive impact on improving patient satisfaction. As a specialist nurse, having skilled and exquisite operating skills is the basis for improving the professional level of nursing. Among the secondary indicators, observation and evaluation capabilities, emergency response and rescue capabilities account for a larger proportion. This is related to the nature of the cardiovascular profession. There are more complications in cardiovascular patients, which requires nurses to be able to make a comprehensive assessment of patients. Evaluate, find problems in time, start emergency procedures when the patient’s condition changes, and take correct measures to make effective and timely responses.
5. Conclusion
The cultivation of the core competence of nurses is a dynamic and evolving process, and the composition and evaluation methods of the core competence evaluation system must be adjusted accordingly as the environment changes. This study constructed a core competence evaluation index system based on a computer mind map. After two rounds of index modification, it enriched the research on the core competence element structure and evaluation criteria of nurses, making the research results more objective, and training and selecting registered nurses. And assessment has certain practical significance.

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References
[1] Adhikari S, Paudel K, Aro A R, et al. Knowledge, attitude and practice of healthcare ethics among resident doctors and ward nurses from a resource poor setting, Nepal[J]. Bmc Medical Ethics, 2016, 17(1):68-75.
[2] Kennedy S J, Blough R A, Kenner C A, et al. An assessment of two training interventions designed to increase the knowledge of obstetrical nurses and nurse-midwives about the maternal serum triple screen[J]. Prenatal Diagnosis, 2015, 18(7):713-720.
[3] Latifi M, Najafizadeh K, Saidi R, et al. Comparing the Effect of an Educational Course About Organ Donation on Knowledge and Attitudes of Nurses and Nurse Supervisors[J]. Transplantation, 2018, 10(2):67-76.
[4] Fuller A, Jenkins W, Doherty M, et al. Nurse-led care is preferred over GP-led care of gout and improves gout outcomes: results of Nottingham Gout Treatment Trial follow-up study[J]. Rheumatology (Oxford, England), 2019, 59(3):1-8.
[5] Tan Z S, Soh M, Knott A, et al. Impact of an Intensive Dementia Caregiver Training Model on Knowledge and Self - Competence: The Improving Caregiving for Dementia Program[J]. Journal of the American Geriatrics Society, 2019, 67(11):43-50.
[6] Protopapas A, Kalogirou F, Vouri N, et al. The effect of multiple interventions by a specialist nurse on the heart failure patients knowledge in self-care management[J]. European Journal of Heart Failure, 2019, 21(1):180-190.