

Constructing a Competency Evaluation Index System for Nursing Positions in a Chronic Kidney Disease Management Centre

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Objective: The Chronic Kidney Disease Management Centre (CKDMC) primarily focuses on developing a new system for early screening, standardised diagnosis, treatment, and the long-term follow-up management of patients with chronic kidney disease (CKD) to enhance CKD prevention and management. Nurses play a pivotal role in the comprehensive management of CKD, contributing considerably to the improvement of patient survival. Consequently, this study constructs an evaluation index system for nursing positions in the CKDMC, delineating the required competencies of nurses and providing a foundation for their targeted training.

Methods: A literature review and semi-structured interviews were used to develop the competency evaluation index system for nursing positions at the CKDMC. The Delphi method, involving expert correspondence, was employed over two rounds of inquiry with 16 experts, focusing on screening, modifying, and refining the indicators at all levels.

Results: The response rates for the first and second rounds of the questionnaire were 100% and 93.8%, respectively, with expert authority coefficients of 0.73 for both rounds. The finalised competency evaluation index system includes 3 primary indicators (theoretical knowledge, practical skills, and professional attitude), 10 secondary indicators, and 44 tertiary indicators.

Conclusion: The study successfully established a CKD specialist nurse competency evaluation index system comprising 3 primary, 10 secondary, and 44 tertiary indicators. The consensus among experts was high, rendering the results scientific, objective, and reliable. This system can serve as a basis for the training, selection, and competency evaluation of nursing professionals in CKDMCs.

Keywords: chronic kidney disease, management centre, competency, index system

Introduction

Chronic kidney disease (CKD) is characterised by abnormalities in kidney structure or function, primarily leading to accelerated ageing and an increased risk of premature death from all causes, including cardiovascular diseases.¹ Research indicates that by 2040, the global years of life lost as a result of CKD could more than double.² China currently has the highest number of individuals with CKD, predominantly among middle-aged and elderly populations.³ The prevalence of CKD in China has risen sharply, increasing from 10.8% to 16.4% between 2012 and 2019, with patient numbers continuing to grow.⁴ Projections suggest that by 2030, over 4 million people in China will have end-stage renal disease, with 1.5–3 million receiving dialysis treatment.⁵ This escalating situation underscores the critical importance of CKD prevention and management and, consequently, the growing demand for enhanced nursing capabilities.

In alignment with the “Healthy China 2030” strategic plan initiated by President Xi Jinping to advance chronic disease management, our hospital launched the Chronic Kidney Disease Management Centre (CKDMC) project on 23 August 2020. The CKDMC is dedicated to improving the standard of CKD prevention and management throughout Shanxi Province.^{6,7} Studies have demonstrated that multidisciplinary collaboration can notably impact the survival outcomes of patients with CKD.^{8–11} In response, many hospitals have initiated CKDMC projects, establishing centres

in which teams comprising doctors, nurses, and nutrition specialists work together. These teams are responsible for the comprehensive management of CKD, encompassing disease assessment and screening, patient education and file management, nutritional assessment, and dietary guidance for outpatients.

Nurses play a vital role in the integrated management of CKD.^{12–15} The diagnosis and management of CKD cover critical areas such as patient awareness, patient engagement, and the effective implementation of evidence-based interventions.¹⁶ Research has identified that the competency of nurses is primarily evident in their clinical practice skills, management capabilities, critical thinking, communication coordination, and professional development.^{17,18} Nursing managers are key to advancing the professional development of nurses specialising in CKD. At present, all departments in Chinese hospitals, including CKDMCs, implement a regular system of assessment for nurses that includes an assessment of nurses' work performance, professional ethics, and professional level. In addition, an evaluation standard has been established for the professional and technical qualifications of nurses and an assessment standard for the promotion of professional titles. By defining the competencies of CKD specialist nurses and developing a nursing competency evaluation system, managers can facilitate the goal of providing scientific, professional, and precise training. This approach also establishes a unified and standardised training programme for CKD nursing professionals, offering theoretical support for the assessment and certification of these specialists.¹⁸ However, specific inclusion criteria for nurses within CKDMCs remain undefined.

Consequently, this study aims to develop an evaluation index system for nursing competencies in CKDMCs. This system is designed to clarify the job responsibilities of nurses, provide a reference for their targeted training, and enhance the integrated management of CKD.

Materials and Methods

A literature review and semi-structured interviews were used to develop the competency evaluation index system for nursing positions at the CKDMC. The Delphi method, involving expert correspondence, was conducted over two rounds of inquiry with 16 experts, focusing on screening, modifying, and refining the indicators at all levels.

Establishing a Research Team

The research team consisted of six members, comprising three head nurses, one attending physician, and two graduate students. The head nurses were primarily responsible for the project's design and implementation, the attending physician focused on the literature search and quality control, and the two graduate students were primarily responsible for data collection and statistical analysis. All team members possess knowledge of evidence-based medicine and CKD care and have received training in the relevant content.

Construction of the First Draft of the Evaluation Index System

Literature Review

To reference and improve on the construction process of similar systems, a literature search was conducted between 2018 and 2023 using databases such as CNKI, Wanfang, PubMed, MedLine, Web of Science, and UpToDate. We used subject headings and keywords including “chronic kidney disease”, “kidney disease”, “renal insufficiency, chronic”, “management”, “nursing”, “nursing ability”, “work ability”, “ability model”, “index system”, “evaluation system”, and “construction” (refer to Figure 1). The competency evaluation index system for nursing positions should encompass theoretical knowledge, practical skills, occupational cognition, emotions, and behaviour. An outline for the semi-structured interviews was established based on these search results.

Qualitative Methods

Since this evaluation system requires the participation of expert teams with different professional and technical titles and diverse professional expertise, the purposive sampling method was adopted to select expert teams with corresponding titles and professional expertise to participate in semi-structured interviews to reach decisions through consensus. The participants were five director from the Department of Nephrology with a senior professional title, eleven nursing managers from the Department of Nephrology with an associate senior title or higher (including five doctor from the

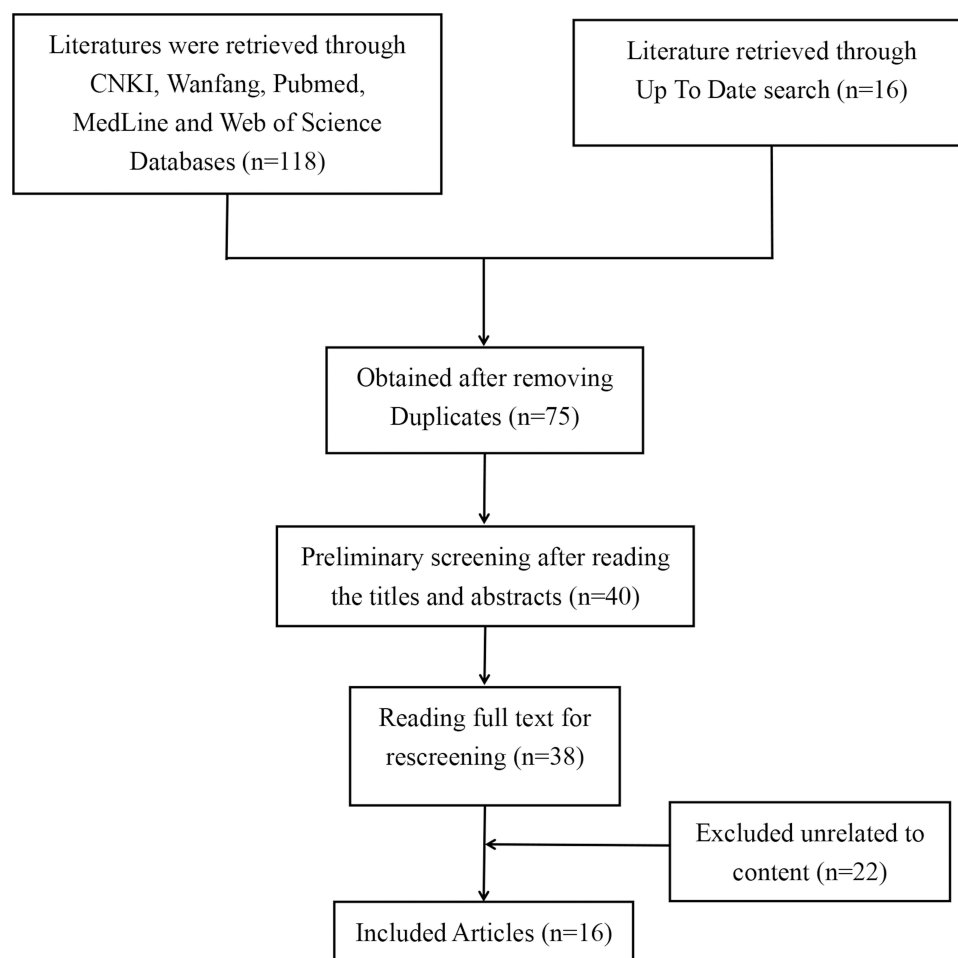


Figure 1 Literature inclusion flow chart.

CKDMC, three nurse from the CKDMC and three CKD nutritionist). One of them is a qualified blood purification specialist nurse in Shanxi Province with over 4 years' experience in continuous renal replacement therapy.

The Delphi method was used to perform an expert evaluation of the competency evaluation index system during the semi-structured interviews. The Delphi method is an anonymous feedback method. In this process, experts are unknown to each other and therefore unable to communicate with each other or exchange opinions. Researchers use questionnaires to obtain expert opinions in multiple rounds of consultation until consensus is reached. Therefore, the strategy is considered highly effective and reliable.¹⁹

The interview focused on the following question: "to achieve the integrated management of patients with CKD, what core competencies should nurses in the CKDMC possess?". Responses were sought in terms of knowledge, skills, attitudes, and literacy. Interviews were conducted one-on-one, each lasting approximately 30 minutes. The content was recorded with consent and then transcribed, organised, and analysed using the Colaizzi seven-step analysis method.^{20–22}

Step 1 of Colaizzi's method is to read and reread the transcribed interviews to obtain a full sense of the words that the participant has shared during the focus group; step 2 is to extract key statements that pertain to the phenomena; step 3 is to formulate meaning from the key statements; step 4 is to aggregate the formulated meanings into theme clusters and themes; step 5 is the development of an exhaustive description of the phenomena, fully encompassing the themes created in step 4; step 6 is to remove any redundant or misused information to distil the essence of the phenomena; step 7 is to validate the exhaustive description and fundamental structure of the phenomena.²³ This process led to the preliminary formation of an item pool for an evaluation index of nursing competencies in the CKDMC, consisting of 4 primary indicators, 12 secondary indicators, and 45 tertiary indicators.

Drafting the Questionnaire for Expert Consultation

The questionnaire was divided into three parts. The first part introduced the study, outlining its purpose and importance, along with instructions for its completion. The second part collected basic information about the experts, such as hospital affiliation, educational background, years of experience, gender, professional title, and their familiarity with and perspectives on the indicators. The third part was the index inquiry form. Here, the importance of each evaluation index was rated using the Likert 5-point scoring method:²⁴ very important (5 points), important (4 points), moderately important (3 points), unimportant (2 points), and very unimportant (1 point). Additionally, a section for “modification opinions” was included.

Selecting Correspondence Experts

Purposive sampling was adopted to select nationwide experts in CKD nursing, nursing education, and nursing management for consultation. The inclusion criteria were as follows: (1) the expert's hospital has implemented the CKDMC project; (2) at least 10 years of experience in nephrology nursing management; (3) possession of a bachelor's degree or higher and a title of associate senior or above; and (4) willingness to actively participate in this research and ability to partake in two or more rounds of correspondence inquiries. According to Hasson Scholars, the optimal number of experts is determined based on the feasibility of objectives and resources,²⁵ with a general recommendation of 15–50 experts.²⁶ In line with these principles, this study included 15–20 experts.

Data Collection

The questionnaires were distributed and collected via mail or in person, with a specified deadline. In February 2023, the first round of expert consultation was completed; 16 questionnaires were distributed, and all were returned. Items with an average importance rating ≥ 3.5 and a coefficient of variation (CV) ≤ 0.25 were retained²⁷ and modified based on expert feedback. The second round of questionnaires, incorporating additions, deletions, mergers, and revisions, was conducted in March 2023. The correspondence inquiries were concluded once the analysis and compilation of expert opinions demonstrated a high degree of consistency (refer to Figure 2).

Statistical Methods

Data processing and analysis were conducted using SPSS 22.0 (IBM Corp., Armonk, N.Y., USA) statistical software. Descriptive analysis of the importance scores was performed using the mean and standard deviation. The level of expert engagement was indicated by the questionnaire return rate. The authority coefficient of the expert (Cr) was determined based on the expert's judgement and familiarity with the question, with the arithmetic mean of these two indicators then calculated. The degree of expert consensus (referring to the consensus among experts regarding the project) and the concentration of expert opinions were measured using Kendall's coefficient of concordance (Kendall's W) and the CV.²⁸ A larger Kendall's W value and a smaller CV value signify greater consistency in expert opinions. A p -value < 0.05 was considered statistically significant.

Results

General Information of Consulting Experts

The research team invited 16 experts, with 11 from tertiary hospitals and 5 from secondary hospitals. The average age of the experts was 44.19 ± 4.67 years, with a gender distribution of 1 man and 15 women. Educational qualifications included 6 experts with master's degrees and 10 with bachelor's degrees. The group comprised 5 senior and 11 associate senior professionals, with an average working tenure of 20.56 ± 5.65 years. These experts hailed from six different provinces and five prefecture-level cities across China.

Expert Activeness and Authority

Two rounds of expert consultations were conducted. In the first round, all 16 (100%) questionnaires were returned, and in the second round, 15 (93.8%) were returned. Moreover, 14 (87.5%) questionnaires in the first round and 12 (80%) in

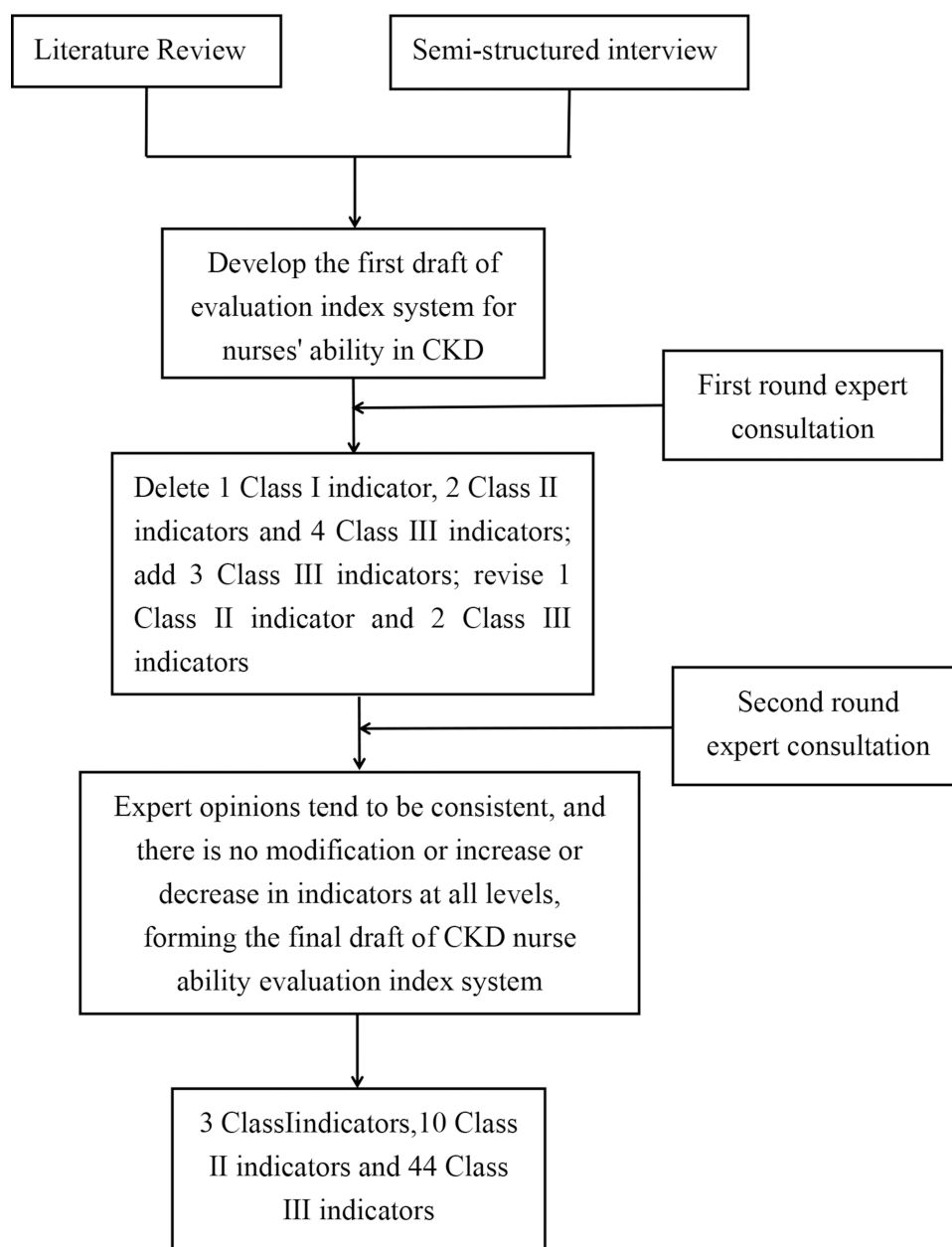


Figure 2 Flow chart for the construction of CKD nurse ability evaluation system.

the second were returned promptly, demonstrating positive expert engagement. The Cr for the experts in both rounds was 0.73, with a Cr ≥ 0.7 generally considered to indicate reliable consultation Results.²⁹

Degree of Coordination Among Expert Opinions

The Kendall's W for the two rounds of consultation were 0.327 and 0.358, with a p -value < 0.01 . The CV ranged between 0 and 0.11. These results indicate a high degree of coordination among expert opinions. Detailed data can be found in Table 1.

Result of the Expert Letter Inquiry

Following the initial round of expert consultation, revisions were made in accordance with the screening criteria and expert feedback. First, the primary indicator, "comprehensive literacy", along with its two secondary and four tertiary indicators, were removed. Experts agreed that the nurses' professional behaviour in the CKDMCs sufficiently reflects

Table 1 Kendall's Concordance Coefficient and Its Significance Test Results of the 2 Rounds of Expert Inquiries

Index	Round 1			Round 2		
	Kendall's W	χ^2	P	Kendall's W	χ^2	P
Primary index	0.335	82.141	<0.001	0.401	80.523	<0.001
Secondary indicators	0.318	116.081	<0.001	0.376	107.461	<0.001
Third-level indicators	0.306	155.713	<0.001	0.312	156.545	<0.001
Sum	0.327	242.047	<0.001	0.358	250.477	<0.001

their professionalism and that the content in question was redundant. Second, three new tertiary indicators were added: (1) “advantages and disadvantages of different renal replacement therapies and preparation of dialysis access” – three experts highlighted the importance for patients with stage 3 CKD to understand the pros and cons of various renal replacement therapies and to arrange vascular access in advance; (2) “the ability to mobilise social support forces (such as family members) to participate in patient education” – four experts emphasised the role of family members as providing crucial social support for patients, advocating for their involvement in patient education to enhance the patient’s adherence to dietary, medication, and exercise regimens; (3)

assistance in creating medication reminder cards, blood pressure record cards, and other tracking tools, as well as managing blood pressure, blood sugar, and weight

– an expert suggested the usefulness of using reminder cards and record cards to track and manage various patient indicators. Additionally, one secondary indicator and two tertiary indicators were revised: (1) “professional action” was updated to “professional behaviour”; (2) “co-developing patient education plans, implementation steps, and goals with doctors and nutritionists” was modified to “ability to understand and assess patients’ needs and collaborate with doctors and nutritionists to formulate patient education plans, implementation steps, and goals”; and (3) “able to formulate personalised dietary guidance programmes with nutritionists based on patients’ eating habits” was changed to “able to create a personalised dietary guidance plan with a nutritionist, based on the patient’s eating habits and other relevant factors, in a goal-oriented manner”.

The experts provided substantial justification for these modifications, which the research team adopted after thorough analysis and consideration. In the subsequent round of expert consultation, the opinions converged, resulting in no further modifications or adjustments to the indicators at any level. After discussions within the research team, the final evaluation index system for nursing competencies in CKDMCs was established, comprising 3 primary indicators, 10 secondary indicators, and 44 tertiary indicators (see Table 2 for details).

Discussion

The nursing competency evaluation index system developed in this study for use in CKDMCs encompasses three first-level indicators: theoretical knowledge, practical skills, and professional attitudes. It also includes 10 secondary indicators: disease Introduction, health guidance knowledge, hospital sense knowledge, nursing operation skills, multi-media application skills, patient education skills, coordination and management skills, occupational cognition, occupational emotion, and occupational behaviour. This index system is comprehensive, covering a range of professional abilities. Our findings align with a United States study³⁰ that identified 20 core competencies for new nurses, including nursing safety plans, mentoring projects, professional practice, and professional knowledge. Similarly, Paans et al³¹ suggested that an excellent nurse should possess nine proficiencies: analysis, communication, cooperation, coordination, knowledge dissemination, innovation, introspection, empathy, and evidence orientation. The competency evaluation index system we constructed aligns with these proficiencies.

Clinical specialist nurses (CNSs) are authorised registered nurses with advanced professional knowledge in specific fields. These nurses have greater experience in patient care, humanistic care, vocational skills, and other related fields and

Table 2 CKD Management Center Nursing Post Competency Evaluation Index System Expert Consultation Results

Primary Index	Secondary Indicators	Third-level Indicators	Score ($\bar{x} \pm s$)	Coefficient of Variation
1. Theoretical knowledge	1.1 Concept of diseases	1.1.1 Anatomy and physiological function of the kidney	4.56±0.20	0.07
		1.1.2 Clinical manifestations and treatment of kidney diseases and complications	4.57±0.33	0.07
	1.2 Health guidance knowledge	1.2.1 Risk factors and countermeasures for the occurrence and development of kidney disease	4.53±0.37	0.08
		1.2.2 Effects, side effects, administration time and methods of commonly used drugs in nephrology	5.00	0
		1.2.3 Dietary principles for patients with chronic kidney disease at different stages of the disease	4.61±0.40	0.05
		1.2.4 Exercise patterns in patients with chronic kidney disease under different comorbidities	4.59±0.36	0.03
		1.2.5 Methods and precautions for various urine specimen collection	4.90±0.55	0.10
		1.2.6 Nephrology common examination precautions	4.64±0.18	0.07
		1.2.7 Home vital signs monitoring methods and precautions	5.00	0
		1.2.8 Advantages and disadvantages of different renal replacement therapies and preparation for dialysis access	4.93±0.34	0.11
		1.2.9 Home care of peritoneal dialysis patients and observation and prevention of complications	5.00	0
		1.2.10 Functional exercise, prevention and monitoring of complications before and after arteriovenous fistula operation	4.73±0.36	0.03
		1.2.11 Precautions and home care before and after kidney transplantation	4.69±0.35	0.04
2. Practical skills	1.3 Sense of knowledge	1.3.1 Risk factors for nosocomial infection	4.60±0.55	0.04
		1.3.2 Basic principles and measures for hospital infection control	4.67±0.24	0.06
	2.1 Nursing skills	2.1.1 Basic nursing skills include aseptic technical operation, vital sign monitoring, oxygen therapy, injection, specimen collection, Cardiopulmonary resuscitation, defibrillation, and patient transfer technology	4.67±0.24	0.06
		2.1.2 Specialized nursing skills include: Peritoneal dialysis fluid change technology, Peritoneal dialysis outlet dressing change technology, arteriovenous fistula monitoring technology	4.66±0.18	0.06
	2.2 Multimedia application skills	2.2.1 Able to use various forms such as images and videos for patient education	4.71±0.40	0.09
		2.2.2 Will maintain the department's official account and publish popular science articles	4.79±0.35	0.03
		2.2.3 Be able to use Tiktok, Kwai, etc. to produce various publicity videos	4.68±0.40	0.06
		2.2.4 I will use office software to organize and archive general information, laboratory results, medication, and other information of patients	4.79±0.35	0.03
		2.2.5 Continuing care services will be provided through phone follow-up and WeChat	4.73±0.36	0.03
	2.3 Patient education skills	2.2.6 Proficient in using patient education tools such as electronic displays and apps	4.68±0.40	0.06
		2.3.1 Be able to understand and assess the needs of patients, and work with doctors and Dietitian to develop patient education plans, implementation steps and goals	4.75±0.23	0.06
		2.3.2 Able to organize and arrange patient education activities, and have good interaction and communication with patients	4.76±0.35	0.07
		2.3.3 Able to summarize and analyze the effectiveness, influencing factors, and improvement measures of patient education	4.73±0.36	0.03
		2.3.4 Being able to mobilize social support forces (such as family members) to participate in patient education	4.71±0.40	0.09

(Continued)

Table 2 (Continued).

Primary Index	Secondary Indicators	Third-level Indicators	Score ($\bar{x} \pm s$)	Coefficient of Variation
3. Professional attitude	2.4 Skills of coordination and management	2.3.5 Be able to work with the Dietitian to develop personalized diet guidance programs based on the patient's diet habits and other goals	4.72±0.27	0.07
		2.3.6 Able to choose exercise methods with appropriate frequency and intensity for patients based on Barthel's self-care ability scores, exercise conditions, etc	4.66±0.18	0.06
		2.3.7 Can help patients create medication reminder cards, blood pressure record cards, etc., and urge them to manage their blood pressure, blood sugar, and weight well	4.70±0.20	0.03
		2.4.1 Able to maintain communication and cooperation with doctors and other relevant professionals, and coordinate patient diagnosis and treatment work	4.72±0.27	0.07
	3.1 Professional awareness	2.4.2 Able to manage the environment and goods, perform cleaning, disinfection, hygiene protection, etc	4.70±0.20	0.03
		2.4.3 Capable of instrument management, regular maintenance and inspection	4.74±0.27	0.07
		3.1.1 Nurses play an important role in integrated patient management	4.65±0.40	0.08
		3.1.2 Nurses can achieve the goal of promoting patient health through patient education	4.67±0.24	0.06
	3.2 Professional emotion	3.1.3 Nurses need to continuously improve their knowledge and skills to excel in nursing positions at CKD management centers	4.70±0.20	0.03
		3.2.1 CKD Management Center nurses have strong comprehensive abilities, good communication skills, high personal qualities, and can meet professional values	4.58±0.25	0.07
		3.2.2 The CKD management center nurses have integrated to slow down the progression of patients' diseases, effectively control complications, and meet a sense of professional achievement	4.57±0.33	0.07
		3.2.3 Nurses have played an extremely important role in the integrated management of CKD and have been recognized by patients and their families, meeting their professional sense of honor	4.56±0.20	0.07
	3.3 Professional behaviors	3.3.1 Having a high level of dedication, able to encourage and guide patients to establish the courage to overcome diseases	4.69±0.35	0.04
		3.3.2 Having a strong sense of responsibility, dedicated to work, and committed to improving the understanding and management level of CKD patients towards the disease	4.71±0.40	0.09
		3.3.3 Having the ability to learn independently, actively participating in training, continuously improving knowledge level and various skills	4.70±0.20	0.03
		3.3.4 Having a stable mindset, able to restrain and sort out negative emotions	4.68±0.40	0.06
		3.3.5 Have safety awareness and actively take preventive measures	4.74±0.27	0.07

therefore focus on education, research, clinical management, and multidisciplinary development with the goal of providing safer, more accessible, and more effective medical services. However, the assessment and evaluation standards for CNSs in various countries are different. In 2021, the American College of Nursing Association released core competency indicators for entry-level professional nurse education, comprising 10 dimensions: nursing theory and practice, person-centred nursing, public health, nursing academic research, nursing quality and safety, interprofessional teamwork, systematic nursing practice, information and communication technology, nursing specialisation, personal leadership, and professional development.³² According to the National Organization for Advanced Practice Nurses, the competence of practising nurses has nine primary indicators: science-based ability, leadership ability, quality control ability, practical inquiry ability, information technology ability, policy ability, healthcare provision ability, ethical ability, and independent practice ability.³³ In mainland China, some hospitals have introduced the concept of CNSs, with their roles including the assessment of nurses' work performance, professional ethics, and professional level. The work performance assessment mainly includes the quality, quantity, technical level, and patient satisfaction of nurses' work. The professional ethics evaluation focuses predominantly on nurses' respect and care for patients, the protection of patient privacy, an emphasis on communication, the embodiment of humanistic care, and the protection of patients' rights and interests. The professional level test is based primarily on the ability of nurses to standardise their practice, correctly implement clinical nursing practice guidelines and nursing technical specifications, provide patients with overall nursing services, and solve practical problems.³⁴ At present, the assessment and evaluation of CNSs in China focus mainly on theory and skills, and the comprehensiveness and practicability of the evaluation system are insufficient. Moreover, this evaluation system adopts the same standard at all levels of nursing and does not reflect the different abilities and responsibilities of different levels of CNSs.³⁵ The evaluation indicators we constructed in this study contain similar aspects, demonstrating their scientific and practical nature.

To facilitate early screening, standardised diagnosis and treatment, and the long-term management of CKD to improve the quality of life of patients and their families, many hospitals have initiated CKDMC projects and established CKDMCs. Nurses are a crucial part of the management team, responsible for clinical follow-up, data collection, and structuring.³⁶ Studies have shown that effective nursing management can enhance the quality of life of patients with CKD, reducing complications and mortality.^{37,38} The quality and service of nurses in the CKDMC directly impact the long-term follow-up rate of patients with CKD. However, challenges exist, such as the absence of entry standards for nurses in these centres, a lack of unified work content requirements, and no quantitative indicators for assessing nurses' service quality. Constructing the nursing competency evaluation index system, based on the current status of CKD management in our country and expert opinions, will help standardise the professional behaviour of nurses in CKDMCs and promote the advancement of CKDMC projects.

Moreover, with the ongoing integration and advancement of internet-based technologies in diagnosis, the enhancement of treatment and nursing services,³⁶ and the development and use of various mobile software in managing patients with CKD, it has become evident that nurses in the CKDMC must extend their expertise beyond just clinical knowledge and skills to meet current work demands. Along with collaborating with multidisciplinary experts to devise a personalised, effective, and comprehensive health guidance path based on the theory of knowledge-belief-behaviour, it is also essential for nurses to employ information technology in evaluating and monitoring patients' health status and in managing health behaviours, remote education, and follow-up.³⁹ In addition, nurses should further enhance their passion for their work and empathy for patients and combine professional knowledge and profound emotions with standardised professional operations to more effectively fulfil their roles in health education and promotion. The competency evaluation index system for nurses in CKDMCs, as formulated in this study, delineates the abilities required for the position. This can motivate nursing staff to improve themselves, assist departments in conducting targeted training, and, ultimately, achieve integrated and precise CKD management. The competency evaluation index system for CKDMC front-line nurses constructed in this study is more targeted and comprehensive than those of previous studies; it clarifies the competency requirements, identifies weaknesses in nurses' competencies, and implements targeted training. In addition, the index system provides a scientific basis for nursing managers to accurately identify, describe, analyse, and evaluate the competency level of front-line nursing staff and implement human resource allocation in the future.

Research funding and time constraints meant that we could only send questionnaires to 16 experts from different regions of China. The experts consulted were optimal in terms of authority, reliability, and representativeness; however, their opinions may not represent the overall view. Furthermore, although we actively encouraged the return of questionnaires, there was a loss rate of approximately 10%; this process therefore requires further optimisation. The current index system is still at the theoretical research stage, and empirical research has not yet been conducted. In the future, this index system will be applied on a large scale in the real world to verify its practicability and popularisation to further improve the evaluation tool.

In future research, we plan to conduct empirical studies in various regions and at different hospital levels, utilising methods such as questionnaire surveys, scale scoring, and other techniques to enhance the training and development of clinical staff, thereby refining the evaluation index system. Additionally, in accordance with Benner's theory,⁴⁰ which suggests that the growth of nursing staff can be categorised into distinct stages and that nurses at different levels possess unique characteristics, we aim to consider developing an ability rating index system tailored to nurses at varying career stages in our subsequent studies.

Conclusion

This study developed an evaluation index system for nursing competency in CKDMCs through a literature review, semi-structured interviews, and the Delphi expert correspondence inquiry method. This system clarifies the job responsibilities of nurses in CKDMCs and provides direction for targeted nurse training within these centres. It also offers a theoretical foundation that can facilitate the integrated management of CKD. However, as internet-based services in chronic disease management continue to evolve and new concepts emerge, the role of nurses in managing patients with CKD will likely undergo adjustments. In the future, the practicality of this indicator system will need to be empirically validated through further research.

Data Sharing Statement

All data generated or analyzed during this study are included in this published article.

Ethics Approval and Consent to Participate

This study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Shanxi Provincial People's Hospital.

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None of the authors have any personal, financial, commercial, or academic conflicts of interest.

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