Journal of Multidisciplinary Healthcare

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

Competency of Nurses in Providing Dietary Guidance to Patients with Chronic Kidney Disease in Anhui Province: Influencing Factors

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Objective: This study aimed to assess the competency of clinical nurses in providing dietary guidance to patients with chronic kidney disease (CKD) and to examine factors influencing this competency.

Methods: A cross-sectional study was conducted across 36 secondary and tertiary hospitals in 11 prefecture-level cities in China between April and May 2024. Data were collected using validated questionnaires clinical nurse assessment tool for chronic kidney disease (CKD) dietary guidance that assessed three domains knowledge, attitudes/beliefs, and practices related to dietary guidance for CKD.

Results: Out of 393 valid responses, the overall mean score for dietary guidance competency was 214.46 ± 25.94. Domain-specific mean scores for knowledge, attitude, and practice components were 3.95 ± 0.61, 4.08 ± 0.41, and 3.72 ± 0.69 respectively. Multiple linear regression analysis identified four significant predictors of competency: departmental affiliation, dedicated learning time, prior nutrition training, and leadership support for dietary education initiatives ($p < 0.05$).

Conclusion: To enhance the competency of nurses in providing dietary guidance to individuals with CKD, healthcare systems should implement standardized nutrition training programs and integrate these with specialized clinical practice to optimize training outcomes.

Keywords: attitude, chronic kidney disease, clinical nurse, dietary guidance ability, influencing factor, knowledge, practice

Introduction

Chronic kidney disease (CKD) represents a prevalent condition characterized by insidious onset and progressive deterioration in renal function. Epidemiological data report a global CKD prevalence of approximately 9.1% with rates as high as 10.8% among Chinese adults aged 18 years and older.[1] Malnutrition, a frequent complication of CKD, constitutes a significant risk factor for disease progression, cardiovascular events, and increased mortality.[2–4] The global prevalence of malnutrition among individuals with CKD has been reported to range from 35.2% to 50.6%.[5]

Dietary intervention has been well-established as an effective and cost-efficient therapeutic approach for the management of CKD and the prevention of its associated complications.[6,7] Therefore, the implementation of evidence-based dietary interventions plays a critical role in addressing malnutrition and improving quality of life in patients with CKD. Current research, both Chinese and international, has primarily focused on nutritional strategies and assessment tools for patients with CKD, with limited attention given to the dietary guidance competencies of healthcare providers.[8]

As primary providers of inpatient dietary guidance, the professional competencies of nurses in this domain significantly influence nutritional outcomes and intervention efficacy. The knowledge, attitudes, and beliefs held by clinical nurses directly affect the development and delivery of effective dietary guidance. While recent studies have examined their role in nutritional management for individuals with diabetes and their attitudes toward exercise recommendations in patients with renal disease, there remains a lack of research specifically examining the dietary management competencies of clinical nurses in the context of CKD.[9,10]

https://doi.org/10.2147/JMDH.S557178
Received: 19 August 2025
Accepted: 24 December 2025
Published: 2 February 2026

This study aimed to comprehensively evaluate the knowledge, attitudes and practices regarding dietary guidance for CKD among nurses in general hospitals throughout Anhui Province, and to identify the factors influencing these competencies. The findings are intended to inform strategies for enhancing the dietary guidance competencies of nurses and contributing to improved nutritional outcomes in individuals with CKD.

Participants and Methods

Study Population

This cross-sectional study employed convenience sampling to recruit clinical nurses from 36 general hospitals across 11 prefecture-level cities in Anhui Province between April and May 2024. Inclusion criteria were as follows: 1) registered nurses holding valid practitioner certificates; 2) a minimum of one year of clinical experience in their current department; 3) The patient is admitted to the Department of Nephrology, Hemodialysis Center, Endocrinology, or Urology; 4) voluntary participation with informed consent. Exclusion criteria included: 1) nurses absent from clinical duties (maternity/sick/personal leave); 2) nurses in advanced training programs, student nurses, or those not engaged in frontline clinical care at the participating institutions.

Assessment Tools

This study employed the "Clinical Nurse Chronic Kidney Disease Dietary Guidance Competency Assessment Form" developed by Wei Ruxian et al[11] based on the knowledge-belief-action theory. The scale was developed through standard procedures, including literature review and Delphi expert consultation. The scale demonstrated a Cronbach's α coefficient of 0.856, I-CVI> 0.833, S-CVI = 0.957, and test-retest reliability of 0.780. The scale comprised: Part 1: Demographic information; Part 2: Nutrition knowledge (18 items); Part 3: Attitude/belief (16 items); Part 4: Practice (21 items). All items were rated on a 5-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree"), yielding a total score range of 55 to 275 points, with higher scores indicating greater competency. To enable cross-dimensional comparisons, standardized scoring rates were calculated as follows:[12]

$$\text{Standardized scoring rate} = (\text{actual score of the dimension} \,/\, \text{maximum possible score of the dimension}) \times 100\%$$

The scale demonstrated good reliability, with a total Cronbach's α of 0.856 and a subscale α coefficients ranging from 0.711 to 0.762. Test-retest reliability was reported at 0.780.

Data Collection

Data were collected using the Sojump online survey platform, which incorporated built-in quality control measures. Logical checks were applied to prevent incomplete or incorrect responses. A minimum completion time of 5 minutes was required to ensure response validity. Additionally, IP and device restrictions were implemented to prevent duplicate submissions.

Statistical Analysis

All data were organized and analyzed employing SPSS 21.0 statistical software (IBM Corp). Descriptive statistical methods were applied to summarize both the general characteristics of participating clinical nurses and their scores on the dietary guidance competency scale for CKD. Categorical variables are expressed as frequencies and percentages, while continuous variables are reported as means with standard deviations. Group comparisons of dietary guidance competency scores based on nurse characteristics were conducted using independent-samples *t*-tests for two group comparisons and one-way analysis of variance for comparisons across multiple groups. To identify factors significantly associated with dietary guidance competency, stepwise multiple linear regression analysis was performed. The inclusion and exclusion criteria for model entry were set at $\alpha_{inclusion} = 0.05$ and $\alpha_{exclusion} = 0.10$) respectively. Statistical significance was defined as $p < 0.05$ for all analyses.

Results

Participants Characteristics

A total of 437 clinical nurses were initially surveyed, of which 393 valid responses were retained after quality control screening, yielding a valid response rate of 89.93%. Participants ranged in age from 22 to 59 years (mean = 32.29 ± 6.28 years) with clinical work experience spanning 1 to 40 years (mean = 10.32 ± 6.89 years). Additional demographic characteristics are presented in Table 1.

Dietary Guidance Competency Scores

The mean total score for dietary guidance competency related to CKD was 214.46 ± 25.94 points, corresponding to a mean item score of 3.90 ± 0.47 points. Based on standardized scoring rates, calculated as the actual score divided by the maximum possible score for each dimension, multiplied by 100%, the dimensions ranked in descending order as follows:

Table 1 General Characteristics of Participants and Univariate Analysis of Influencing Factors for Dietary Guidance Competency for CKD (n = 393)

Item	Frequency	Dietary Guidance Ability Score (point, $\bar{x} \pm s$)	Cohen's d/η^2	*p* value
Sex			2.309	0.028
Male	21 (5.3%)	202.33±24.67		
Female	372 (94.7%)	215.15±25.88		
Age			0.013	0.159
<30	179 (45.5%)	215.60±25.29		
30~<40	174 (44.3%)	212.29±26.38		
40~<50	33 (8.4%)	215.85±26.35		
≥50	7 (1.8%)	232.86±25.48		
Educational Qualification			0.002	0.666
College degree	35 (8.9%)	218.23±23.34		
Bachelor's degree	351 (89.3%)	214.11±26.23		
Master's degree or above	7 (1.8%)	213.43±26.08		
Years of working			0.012	0.200
<10	228 (58%)	213.42±25.61		
10~<20	129 (32.8%)	214.81±26.10		
20~<30	32 (8.1%)	217.28±27.04		
≥30	4 (1%)	240.00±25.53		
Technical Title			0.006	0.471
Nurse	41 (10.4%)	213.59±23.07		
Nurse practitioner	172 (43.8%)	216.04±25.04		
Nurse-in-charge	168 (42.7%)	212.54±27.37		
Associate chief nurse or above	12 (3.1%)	221.67±27.80		
Hospital level			0.012	0.311
Tertiary Grade A	280 (71.2%)	215.85±26.17		
Tertiary Grade B	43 (10.9%)	213.35±26.92		
Secondary Grade A	52 (13.2%)	207.63±25.24		
Secondary Grade B	2 (0.5%)	224.50±34.65		
Other	16 (4.1%)	214.13±19.13		
Departments			0.093	<0.001
Nephrology Department	139 (35.4%)	223.43±27.36		
Endocrinology Department	59 (15%)	203.78±23.65		
Urological Surgery Department	91 (23.2%)	206.11±24.07		
Blood Purification Center	104 (26.5%)	215.84±22.37		

(*Continued*)

Table 1 (Continued).

Item	Frequency	Dietary Guidance Ability Score (point, $\bar{x} \pm s$)	Cohen's d/η^2	*p* value
Having time to learn nutrition knowledge			0.095	<0.001
Yes	282 (71.8%)	219.46±25.35		
No	111 (28.2%)	201.77±23.02		
Duration of nutrition training			0.084	<0.001
Not attended any nutrition classes	60 (15.3%)	201.47±22.23		
Attended Part of the nutrition class	229 (58.3%)	213.15±24.83		
Having attended nutrition lectures	79 (20.1%)	223.73±26.00		
Having attended nutrition training or nutrition nursing training	25 (6.4%)	228.32±28.32		
Frequency of nutrition training			0.133	<0.001
Once a week	18 (4.6%)	227.39±25.57		
Once a month	95 (24.2)	226.43±25.56		
Once half a year	61 (15.5%)	217.90±22.80		
Once a year	45 (11.5%)	213.38±29.90		
Occasional	100 (25.4%)	209.90±25.94		
None	74 (18.8%)	199.93±19.43		
Person responsible for dietary training and education			0.013	0.272
Doctor in charge	10 (2.5%)	214.10±32.13		
Charge nurse	322 (81.9%)	214.93±26.26		
Nutritionist	10 (2.5%)	209.90±18.28		
Specialized nutrition nurse	21 (5.3%)	221.57±22.83		
Other	30 (7.6%)	206.03±23.74		
Leaders supervising dietary propaganda and education			0.046	<0.001
Yes	354 (90.1%)	216.30±25.87		
No	39 (9.9%)	197.74±20.17		

attitudes and beliefs, followed by nutrition knowledge, and practices. Detailed results are presented in Table 2. Table 3 presents the five questionnaire items with the lowest mean scores.

Univariate Analysis

Univariate analysis identified statistically significant differences ($p < 0.05$) in dietary guidance competency scores across several variables: sex, departmental assignment, availability of dedicated time for nutrition learning, participation in nutrition training, frequency of nutrition training sessions, and leadership oversight for dietary education. In contrast, no significant differences were observed between competency scores and age, educational attainment, years of clinical experience, hospital level (secondary vs tertiary), professional title, or assigned dietary education responsibilities ($p > 0.05$), as shown in Table 1.

Table 2 Dimensional Scores and Standardized Scoring Rates for Clinical Nurses on Dietary Guidance Competency for CKD (n = 393)

Dimension	Score Range (Point)	Dimension Score (Point, $\bar{x} \pm s$)	Mean Score of Entries (Point, $\bar{x} \pm s$)	Standard Scoring Rate (%)
Attitude/belief	47~80	65.24±6.49	4.08±0.41	81.50
Nutrition knowledge	37~90	71.15±10.92	3.95±0.61	78.61
Practice	41~105	78.07±14.50	3.72±0.69	74.57
Total score of dietary guidance ability	155~275	214.46±25.94	3.90±0.47	77.91

Note: Standard scoring rate = Actual score of this dimension/Possible highest score of this dimension × 100%.

Table 3 Five Lowest-Scoring Items for Clinical Nurses on Dietary Guidance Competency for CKD (Points, $\bar{x} \pm s$, n = 393)

Dimension	Item Description	Item Score
Practice	14. Teach patients the method of making wheat starch food.	2.83±1.44
Practice	13. Prepare diet for patients according to food exchange practices for CKD.	3.10±1.39
Practice	16. Encourage patients to raise questions related to diet. They can ask a nutritionist for help when they cannot answer these questions.	3.19±1.32
Practice	18. Require patients to record their diet and adjust the diet for them after analysis and evaluation.	3.26±1.29
Nutrition knowledge	18. Calculate the most reasonable number of servings of meat, eggs, milk, and soybean protein a patient should consume a day according to food exchange for CKD in China.	3.50±0.92

Table 4 Multiple Linear Regression Analysis of Factors Influencing Dietary Guidance Competency for CKD Among Clinical Nurses (n = 393)

Item	Regression Coefficient	Standard Error	Standard Regression Coefficient	*t* value	*p* value
(Constant)	179.934	4.061	–	44.309	<0.001
Time for nutrition learning	11.488	2.574	0.200	4.462	<0.001
Leaders supervising dietary training and education	12.262	3.821	0.141	3.209	<0.001
Departments[a]					
Nephrology Department	4.902	0.885	0.271	5.539	<0.001
Blood Purification Center	4.547	1.436	0.155	3.167	<0.002
Duration of nutrition training[b]					
Attended nutrition lectures	4.235	1.439	0.131	2.944	<0.003
Attended nutrition training	4.037	1.576	0.114	2.561	<0.011
Frequency of nutrition training[c]					
Once a week	2.580	1.104	0.104	2.337	<0.020
Once a month	3.453	0.701	0.228	4.923	<0.001
Once half a year	2.636	1.088	0.111	2.422	<0.016

Note: $R = 0.532$, $R^2 = 0.283$, adjusted $R^2 = 0.266$, $F = 16.772$, $p < 0.001$, [a]endocrine department as reference group, [b]completely absent as reference group, [c]none as reference group.

Multivariate Regression Results

A stepwise multiple linear regression analysis was conducted, with dietary guidance competency as the dependent variable and significant univariate factors as independent variables. The following coding scheme was applied: Time for learning and leadership supervision: No = 0, Yes = 1; Department: Endocrinology served as the reference category; and Training participation and frequency: No training served as the reference category.

The final regression model identified five variables as significant predictors ($p < 0.05$): departmental assignment, availability of learning time, participation in nutrition training, training frequency (at least twice annually), and leadership supervision of dietary education. These results are detailed in Table 4.

Discussion

Status of Dietary Guidance Competency in Nurses in the Context of CKD

The present study found that the overall dietary guidance competency of clinical nurses caring for patients with CKD was moderate, yielding a total score of 214.46 ± 25.94, and a mean score of 3.90 ± 0.47. These findings indicate that there remains scope for improvement in this area. Evidence-based dietary management constitutes an essential component of comprehensive CKD care.[13–15] Prior research has established that appropriate dietary interventions can effectively slow disease progression and mitigate complications in patients with CKD, particularly through protein intake regulation.

Given their role as primary providers of inpatient care, nurses are often the principal source of dietary education for hospitalized patients with CKD. The current findings suggest that the knowledge possessed by nurses and their ability to translate this knowledge into practice directly influences the quality of nutritional guidance provided, subsequently affecting clinical outcomes. These results highlight the need for nursing administrators to systematically evaluate current dietary guidance practices, enhance awareness of nutritional education among nursing staff, standardize dietary counseling protocols, and develop comprehensive training programs to optimize dietary management competencies.

Findings from this study revealed that among the three dimensions of clinical nurses' competency in providing dietary guidance for chronic kidney disease (CKD), the scores ranked from highest to lowest were attitude/belief, nutritional knowledge, and behavioral practice. The behavioral practice dimension scored the lowest (3.73 ± 0.69), indicating significant difficulties in translating theoretical knowledge into practical guidance. Specifically, notably low scores were observed for the items "teaching patients how to prepare starch-based foods" (2.82 ± 1.43) and "using the CKD food exchange portion method to plan diets for patients" (3.09 ± 1.40). Furthermore, 53.77% of nurses reported uncertainty regarding the scientific calculation of patients' daily protein intake, reflecting an inadequate mastery of professional dietary guidance tools. These findings align with Trigueros-Flores et al,[16] who reported patient experiences of "information confusion, dietary behavior deprivation, and reshaping", and are consistent with Wang Yikun et al,[17] who highlighted the various confusions patients face in implementing low-protein diets. Together, these results illuminate the prevalent "knowing-doing gap" in current clinical dietary guidance.

The primary reasons for this issue are threefold. First, there is a lack of interprofessional collaboration mechanisms, particularly a shortage of clinical nutritionists, leaving nurses without adequate professional support. Second, heavy nursing workloads compress the time and energy available for conducting in-depth dietary guidance. More fundamentally, institutional undervaluation of this competency results in a lack of standardized training protocols and resource allocation.

To address these practice challenges, we recommend that nursing managers first precisely identify these competency gaps and prioritize strengthening training in practical skills, such as the CKD food exchange portion method. Training content should be simplified, and user-friendly dietary planning tools should be developed to facilitate teaching by nurses and application by patients and their families. Building on this, it is crucial to establish standardized collaboration protocols between nurses and nutritionists, potentially leveraging digital health platforms to optimize professional support. Structured dietary guidance should be integrated into standardized care pathways. Finally, integrating this competency into nurse performance evaluation and career development systems is essential. These multi-level strategies are necessary to systematically address the practical barriers and ultimately enhance the quality of dietary management for patients.

A review of the literature reveals a paucity of studies examining knowledge of dietary guidance in nurses caring for patients with CKD, in both China and international contexts. When compared with studies assessing the dietary management knowledge in nurses caring for patients with diabetes, this study demonstrated relatively higher standardized scoring rates.[9] Three potential factors may explain these findings:. 1) The study cohort predominantly comprised nurses from nephrology and related specialty departments, where exposure to CKD cases is frequent. This clinical environment likely fosters greater emphasis on familiarity with CKD dietary management protocols. 2) The voluntary nature of participation may have introduced selection bias, as nurses with perceived knowledge deficits might have declined participation, potentially inflating overall scores. 3) Nurses employed in tertiary hospitals accounted for 82.1% of the study population, a population with greater access to continuing medical education and specialized training opportunities. Supporting evidence from Pan et al indicates that primary care providers often demonstrate poorer CKD knowledge retention attributable to resource limitations, generally lower qualification levels, and reduced training access.[18] The comparatively low representation of nurses from primary care settings (17.9%) may have contributed to the elevated knowledge scores observed. It is also the deficiency of this study, which limits the applicability of the conclusions of this study in primary hospitals.

Given the crucial role of primary healthcare facilities in CKD screening and early intervention, future research should prioritize broader sampling from these clinical settings. This approach would enable more comprehensive evaluation of dietary guidance competencies among frontline healthcare providers and facilitate development of targeted interventions to strengthen primary care capabilities for CKD management.

Analysis of Factors Influencing Dietary Guidance Ability in Nurses

Influence of Departmental Assignment on Dietary Guidance Competency

This study evaluated the dietary guidance competency of nurses in the context of CKD, a specialized area of care that led to the predominant inclusion of participants from nephrology-related departments. Nurses in the Nephrology Department and Blood Purification Center demonstrated significantly higher dietary guidance competency scores compared to those in the Endocrinology Department and Urological Surgery Department. This disparity likely reflects that CKD represents a primary disease focus in nephrology settings, whereas it typically occurs as a comorbidity in endocrinology and urological surgery contexts.

These findings suggest that clinical nurses exhibit greater proficiency in managing diseases central to their specialty while showing reduced emphasis on conditions beyond their primary scope of practice. These results carry particular significance given the aging population and rising prevalence of multimorbidity, which increasingly demand comprehensive dietary guidance competencies across all clinical specialties. Nursing administrators should consider implementing department-specific training programs that address common non-specialized conditions while strengthening interdisciplinary collaboration and resource sharing to optimize educational efficiency.

The results of this study found that nurses with dedicated time allocated for nutrition-related learning exhibited significantly higher dietary guidance competency for patients with CKD. While knowledge and skill acquisition require sustained learning, competing clinical workloads and personal commitments frequently constrain available learning opportunities. Nursing management should address this discrepancy by implementing workflow efficiency and promoting time management strategies. Furthermore, fostering self-directed learning skills may enhance professional competency development by increasing intrinsic motivation and reducing educational burnout within constrained timeframes.[19]

The study also identified a positive association between regular departmental supervision of dietary education and higher competency scores. Supervision and evaluation mechanisms are critical for maintaining nursing quality. Therefore, nursing administrators should establish structured inspection and assessment protocols, define department-specific evaluation metrics, and implement continuous monitoring and feedback systems to improve guidance ability.

Role of Standardized Nutrition Training

This study identified participation in nutrition training and the frequency of such training as significant factors influencing the competency of nurses in providing dietary guidance for individuals with CKD. Nurses who attended structured nutrition lectures or training programs demonstrated significantly higher performance levels. Similarly, institutions conducting biannual or more frequent training sessions showed marked improvements in dietary guidance outcomes. Notably, only 6.18% of surveyed nurses reported receiving formal nutrition or nutrition nursing training, highlighting a critical gap in standardized training programs. These findings are consistent with those of Yuan et al, whose large cross-sectional study of 1300 clinical nurses reported moderate levels of nutrition-related competency among participants.[20]

To address these gaps, nursing administrators should implement standardized nutrition training through structured curricula that optimize content relevance and delivery methods. Given the variation in nutritional support requirements across patient conditions, training programs should be department-specific to address distinct clinical needs. Department-specific programs can ensure alignment with actual practice needs and enhance the translation of knowledge into clinical interventions.

Future research should focus on identifying optimal training models and pedagogical strategies, establishing formal coursework in clinical nutrition for nurses, and institutionalizing continuing education in nutrition nursing. Training efficacy should be assessed using validated tools, such as the Nutritional Care Competence Scale for Clinical Nurses,[21] with periodic outcome evaluations to ensure sustained competency development in clinical nutrition practice.

Limitations

This study has several limitations. The use of convenience sampling may lead to selection bias, and the proportion of nurses in nephrology-related departments is too high (82.1%). It is primarily applicable to groups with similar conditions to those of nephrology nurses in China's tertiary hospitals. Caution is needed when generalizing to nurses in secondary hospitals, primary healthcare institutions, or other non-specialized departments. In addition, the omission of variables

such as nursing workload and the availability of dietitians was also a limitation of this study. Future research should adopt a multicenter design with expanded sample sizes and greater diversity. By incorporating qualitative interviews and other mixed-method approaches, we can gain deeper insights into practical barriers to implementation, thereby enhancing the representativeness and external validity of the findings. It is particularly crucial to include nurses from various clinical departments and healthcare institutions, especially primary care facilities, to develop comprehensive and scalable strategies that effectively improve dietary guidance capabilities in chronic kidney disease management.

Conclusion

This study assessed the dietary guidance competency of clinical nurses in the management of CKD across general hospitals in Anhui Province, utilizing a standardized assessment framework. The results indicated that while nurses possessed adequate theoretical knowledge, their practical dietary guidance skills required significant improvement. Multivariate analysis revealed several factors influencing competency: departmental assignment, availability of dedicated learning time, participation in nutrition training programs, frequency of nutrition training sessions, and the presence of supervisory oversight for dietary education. These results suggest that interventions targeting these factors may be a potential way to improve practical dietary guidance skills. The following measures are recommended: Development and delivery of department-specific training programs for both specialized and common comorbid conditions; implementation of standardized nutrition training curricula tailored to the clinical needs of various specialties; promotion of self-directed learning among nursing staff; and establishment of comprehensive monitoring and evaluation systems.

Data Sharing Statement

All data generated or analysed during this study are included in this article. Further enquiries can be directed to the corresponding author.

Ethics Approval and Consent to Participate

The study was conducted in accordance with the Declaration of Helsinki (as was revised in 2013). The study was approved by Ethics Committee of the Anhui Medical University. Written informed consent was obtained from all participants.

Acknowledgments

We are particularly grateful to all the people who have given us help on our article.

Funding

National Natural Science Foundation of China, Upper-level Project (Project Grant No. 72474001); Anhui Provincial Natural Science Foundation Upper Level Project (Project No. 2308085MH285).

Disclosure

The authors declare that they have no competing interests in this work.

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