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Design of Application of Peer Instruction in Nursing Education for Dialysis Patients

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Abstract: The long-term quality of life of dialysis patients is closely linked to their self-management abilities, such as fluid intake control, medication compliance, and fistula care. Traditional health education models for dialysis patient care, characterized by one-way instruction and a lack of interaction, often result in low patient compliance and inadequate knowledge acquisition. Peer instruction, as a patient-centered educational strategy, leverages the emotional resonance of "shared experiences" and the demonstrative effect of peers, and has been proven effective in improving self-management behaviors among chronic disease patients. This study focuses on the dialysis patient population, integrating clinical practice and technological innovation to deeply analyze the application pathways, effectiveness, and challenges of peer instruction. It aims to provide new ideas and methods for enhancing the quality of nursing education for dialysis patients, thereby improving their knowledge acquisition, self-care abilities, treatment compliance, and overall quality of life.

Keywords: Peer instruction; Dialysis patients; Nursing education

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1. Introduction

With the advancement of modern medicine, dialysis technology has become one of the critical treatment methods for patients with end-stage renal disease [1]. Dialysis treatment is not only a complex medical process but also requires patients to acquire extensive disease-related knowledge and self-management skills, such as dietary control, fluid management, prevention and management of dialysis complications, and vascular access maintenance [2]. However, many dialysis patients lack sufficient understanding of their disease, possess inadequate self-care abilities, and exhibit low treatment compliance, which significantly diminishes the effectiveness of dialysis therapy and severely impacts their quality of life. Therefore, hospitals and dialysis centers are actively guiding nursing staff to provide patient education during dialysis to enhance patients' self-management capabilities, reduce the incidence of complications, and improve the quality of treatment.

Through education, patients can learn about the etiology, pathogenesis, and progression of chronic renal failure, understand the importance and necessity of dialysis treatment, and thus cooperate better with their treatment. Simultaneously, patients can gain knowledge about the principles, methods, frequency, and duration of dialysis, familiarize themselves with pre-dialysis preparations, intra-dialysis precautions, and post-dialysis care, thereby reducing fear and anxiety related to dialysis. Patients can also learn about potential complications during dialysis and their symptoms, acquire self-observation and monitoring skills, and take appropriate measures promptly when abnormalities occur. Studies have shown that systematic nursing education significantly improves the self-management abilities of dialysis patients. For example, Mao found that intensive health education for hemodialysis patients enhanced their knowledge of hemodialysis, reduced mortality and readmission rates, and decreased the incidence of post-dialysis complications [3]. Previous research demonstrated that intensified psychological nursing effectively alleviated anxiety, depression, and other negative emotions in maintenance hemodialysis patients [4]. Li and Chen discovered that psychological nursing combined with health education effectively improved patients' negative emotions and increased their health knowledge awareness [5]. Furthermore, patients can learn how to care for vascular access, manage diet and fluid intake, and administer medications, thereby enhancing their self-care abilities and quality of life. More importantly, nursing education can help patients understand successful cases and rehabilitation experiences related to dialysis treatment, bolstering their confidence and hope, and encouraging a positive outlook on their disease.

Although providing nursing education to dialysis patients has become a consensus, traditional education models often suffer from issues such as lack of standardized content, methods, and evaluation mechanisms, which significantly constrain the effectiveness of nursing education. How to improve the quality of nursing education for dialysis patients and help them better cope with the challenges posed by their disease has become an urgent issue in the nursing field. This study attempts to integrate peer instruction into the nursing education of dialysis patients to address the difficulties and shortcomings of traditional nursing education and enhance the quality of nursing education.

2. Problems in patient education for dialysis patients

2.1. Limitations of traditional education models

Currently, patient education for dialysis patients is primarily conducted by healthcare professionals through traditional methods such as group lectures, distribution of promotional materials, and one-on-one explanations. Although healthcare professionals possess professional expertise, this model has significant shortcomings. First, the substantial knowledge gap between healthcare professionals and patients creates communication barriers, making it difficult for patients to comprehend complex medical information. Second, group lectures struggle to meet the individualized needs of patients. Patients often assume a passive role during the learning process, lacking active participation and interaction, which results in poor learning outcomes. Studies indicate that under traditional education models, dialysis patients have a low level of disease-related knowledge and poor treatment compliance. Some patients frequently experience complications due to insufficient knowledge and poor adherence, severely impacting the effectiveness of dialysis treatment and their quality of life. Additionally, patients with limited education or language barriers often struggle to understand the educational content, further diminishing the effectiveness of the education.

2.2. Insufficient educational content, methods, and resources

Patient-education materials are monolithic and standardized, neglecting individual differences in age, culture, and disease trajectory, which yields uneven outcomes. Many institutions also update their content infrequently, omitting the latest treatment and nursing evidence and thereby undermining both scientific rigor and practical relevance. Delivery still relies predominantly on didactic lectures and printed handouts, which are monotonous and fail to engage patients. The absence of interaction and feedback forces learners into passive reception, hindering deep understanding and retention. Compounding these shortcomings, educational resources are scarce: nurses are overburdened and lack time for systematic instruction, while many facilities lack the necessary equipment, materials, and venues, further constraining effective education.

2.3. Lack of family, social support, and evaluation mechanisms

Family members often have limited understanding of dialysis treatment and nursing knowledge, making it difficult for them to provide effective home-based support. Community and societal support systems for dialysis patients are also underdeveloped, leaving patients without sustained social assistance. Cultural and social factors further impact the effectiveness of patient education. Patients from different cultural backgrounds vary in their acceptance and needs regarding educational content, necessitating more culturally adaptive approaches. Some patients, due to social stigma and discrimination, are reluctant to disclose their condition, which further hinders the implementation and effectiveness of education. Additionally, the absence of robust evaluation and feedback mechanisms poses a challenge. The lack of unified evaluation standards makes it difficult to objectively assess the actual impact of patient education. There is also no effective feedback mechanism post-education to promptly identify and address problems patients encounter in practical application.

3. Application design of peer instruction in patient education for dialysis patients

Peer instruction is a student-centered teaching method that enhances learning outcomes by enabling learners to teach and learn from each other, collaboratively accomplishing learning tasks [6]. In peer instruction, students are not only recipients of knowledge but also disseminators and creators of knowledge. Learners can observe the behaviors, attitudes, and coping strategies of peer educators and internalize them. Dialysis patients share similar disease experiences and life backgrounds, making it easier to foster resonance and a sense of identity. Moreover, peer instruction provides a platform for interactive communication among dialysis patients. Through exchanges with peer educators and other learners, patients can share their experiences and confusion, understand disease knowledge from different perspectives, and thereby deepen their understanding of the disease and improve their self-management abilities [7,8]. The application of peer instruction is expected to enhance dialysis patients' mastery of disease knowledge, self-care abilities, and treatment compliance, ultimately improving their quality of life. It also offers nursing educators an effective teaching model for reference. Below is the design framework for applying peer instruction in patient education for dialysis patients.

3.1. Research subjects

A total of 100 dialysis patients from the nephrology department of a tertiary hospital were selected as research subjects. All patients met the criteria for end-stage renal disease requiring dialysis and voluntarily participated in the study. The patients were randomly divided into a control group and an observation group, with 50 patients in

each group. There were no statistically significant differences between the two groups in terms of age, gender, dialysis duration, or disease severity, ensuring comparability.

3.2. Research methods

3.2.1. Control group

The control group received traditional nursing education, where nurses delivered dialysis-related knowledge and self-care skills through verbal explanations and distribution of promotional materials.

3.2.2. Observation group

The observation group underwent peer instruction, implemented through the following steps.

(a) Selection Criteria: Dialysis duration ≥ 1-year, stable condition, and adequate dialysis efficacy. Good treatment compliance, strictly adhering to diet, fluid control, and dialysis treatment plans. Strong communication and expression skills, willing to share experiences and knowledge. Education level of junior high school or above, capable of understanding and mastering basic educational content.

(b) Selection Process: Healthcare professionals recommended or patients self-nominated eligible candidates. Preliminary interviews were conducted to assess communication skills, willingness to participate, and disease knowledge. Final selection of peer educators was made based on the interviews.

3.2.3. Training of peer educators

In the observation group, this study includes several patients whose condition was relatively stable, who possessed a basic understanding of dialysis, and who demonstrated good communication skills to serve as peer educators. These individuals then participated in an intensive one-week training program covering the principles of dialysis, modality selection, prevention and management of complications, dietary and nutritional management, and fluid control. In parallel, they received instruction in communication techniques, with active listening, clear expression, constructive feedback, and nonverbal cues, to ensure effective patient engagement. Finally, they were trained in instructional methods, including facilitating small-group discussions, analyzing case studies, role-playing, sharing personal experiences, and guiding learners toward active participation and interaction.

3.2.4. Training methods

Peer educators are trained through a combination of lectures, hands-on practice, case analysis, and experience sharing. Nephrologists, dietitians, and clinical psychologists are invited to deliver systematic, evidence-based sessions on core topics. Trainees then engage in simulated teaching exercises using role-play to master instructional techniques and communication skills. Real-world patient cases are analyzed to discuss how to tailor education and guidance to individual needs. Finally, experienced peer educators are invited to share their practical insights and lessons learned.

3.2.5. Implementation process of peer instruction

(1) Needs assessment. Before peer teaching begins, conduct a comprehensive evaluation of each new dialysis patient. Collect data on educational background, baseline disease knowledge, learning capacity, psychological status, and daily habits through questionnaires and structured interviews; use the findings to tailor individualized teaching plans.

(2) Personalized teaching plan. Using the needs-assessment results, design a customized plan for every patient that specifies learning objectives, content priorities, instructional methods, and a realistic timeline. Content should cover all key aspects of dialysis therapy, selected and sequenced according to the patient's profile and expressed needs.
(3) Instructional delivery. Peer educators conduct one-on-one sessions with new dialysis patients, following the individualized teaching plan to impart disease knowledge and self-management skills step by step. Throughout the process, educators actively listen to patients' questions and concerns, providing timely explanations and guidance.
(4) Small-group teaching. Patients with similar needs and issues are grouped together for facilitated discussions and experience-sharing activities. Acting as facilitators, peer educators guide group members through interactive exchanges, collaborative problem-solving, and mutual support.

3.2.6. Teaching effectiveness evaluation

Assessments are conducted before the intervention, one month after, and three months after to observe the sustainability of the outcomes. Questionnaires are used to administer pre-tests and post-tests of disease-related knowledge, covering dialysis principles, dietary management, fluid control, and complication prevention, so as to measure changes in patients' mastery of information. Compliance with dialysis treatment, dietary restrictions, fluid management, and medication regimens is evaluated by reviewing medical records, dialysis charts, and through direct communication with the patients. The Kidney Disease Quality of Life Short Form (KDQOL-SF) is employed to appraise quality-of-life changes before and after the intervention across physical, psychological, social, and symptom-burden domains. Finally, questionnaires are distributed to gauge patient satisfaction with peer teaching, addressing content, methodology, and the performance of peer educators.

4. Advantages of peer-teaching in dialysis patient education

4.1. Shift in educational philosophy

Peer-teaching pivots dialysis education from a clinician-centered model to a patient-centered one. Instead of nurses delivering one-way lectures, patients learn from and with one another. This emphasis on self-directed learning unleashes patients' intrinsic motivation, they move from passive recipients to active investigators of knowledge, enhancing both mastery and self-management.

4.2. Innovation in pedagogical methods

One-on-one coaching, small-group discussions, lived-experience sharing, and bedside demonstrations diversify the traditional "pamphlet-and-talk" format. These approaches accommodate varied learning styles and boost both relevance and efficacy. Moreover, the collaborative nature of peer sessions cultivates teamwork and communication skills. Because peer educators speak from first-hand experience, their narratives resonate more deeply than textbook descriptions, enriching content and forging emotional connections.

4.3. Strengthening self-management

Through ongoing dialogue, patients absorb disease-specific knowledge and concrete self-care techniques. Observing and rehearsing peer educators' behaviors foster self-efficacy; mutual encouragement and gentle

accountability keep patients engaged in daily self-care routines. Exchanging coping strategies deepens understanding of dialysis, bolsters confidence, and ultimately improves treatment adherence and quality of life.

5. Conclusion

As awareness of dialysis and patients' quality-of-life needs grow, peer-teaching has emerged as a powerful educational strategy. By re-centering the learner, diversifying delivery methods, and cultivating self-management, it enhances knowledge, adherence, and well-being. Yet challenges remain, including peer educators are laypersons whose content may lack consistency or rigor, and most evaluations focus on short-term rather than sustained outcomes. Regular professional training, on-call clinical supervision, and structured channels for rapid consultation can mitigate these issues. Continued refinement will help identify the optimal blend of peer insight and clinical expertise, ensuring dialysis education remains both scientifically sound and deeply human.

Disclosure statement

The authors declare no conflict of interest.

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