

# Impact of a Nurse-Led Chronic Disease Management Intervention Model on Quality of Care and Satisfaction of Maintenance Hemodialysis Patients

Lanlan Wang<sup>1</sup>, Jing Li<sup>1</sup>, Yunxiang Shen<sup>1</sup>, Guijun Dai<sup>1</sup>, Lingling Guo<sup>2</sup>, Chunxiang Zhuang<sup>1\*</sup>

<sup>1</sup>Department of Blood Purification, The First People's Hospital of Changzhou Jintan, Changzhou 213200, Jiangsu Province, China

<sup>2</sup>Jiangsu Medicine Vocational College, Yancheng 224000, Jiangsu Province, China

\*Corresponding author: Chunxiang Zhuang, zcx8369@163.com

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**Abstract:** *Objective:* To explore the impact of a nurse-led chronic disease management model on the quality of care and satisfaction of maintenance hemodialysis patients. *Methods:* 72 patients who received maintenance hemodialysis (MHD) from June 2021 to March 2022 were selected to undergo the nurse-led chronic disease management model. The hemodialysis indexes, nutritional status, and the occurrence of adverse events were assessed after 24 weeks of the intervention, and patients' satisfaction was investigated and analyzed. *Results:* Comparing pre-intervention and after 24 weeks of intervention, urea reduction rate and urea clearance were improved but not statistically different ( $P > 0.05$ ), but  $\beta_2$ -microglobulin was significantly reduced compared with pre-intervention ( $P < 0.05$ ); after 24 weeks of intervention, the effect of decreasing blood calcium, parathyroid hormone, and potassium levels was not obvious ( $P > 0.05$ ), and the level of blood phosphorus decreased significantly compared with pre-intervention ( $P < 0.01$ ), albumin and hemoglobin levels were increased and better than before intervention ( $P < 0.05$ ); after 24 weeks of intervention, the incidence of intradialytic hypotension and hypertension was lower than before intervention ( $P < 0.05$ ), and the total incidence of complications was significantly lower than before intervention ( $P < 0.01$ ); there was no significant difference in the Self-Depression Scale scores after 24 weeks of intervention ( $P > 0.05$ ), and Self-Anxiety Scale scores were significantly lower and better than before intervention ( $P < 0.01$ ). Patient satisfaction was greatly improved, with a statistically significant difference ( $P < 0.05$ ). *Conclusion:* The chronic disease management intervention model led by specialized nurses is conducive to improving the psychological state and nutritional status of dialysis patients, enhancing the adequacy of dialysis for patients, reducing the incidence of related complications, and ultimately achieving the purpose of improving the quality of life of patients, which has significant clinical value.

**Keywords:** Specialized nurse-led intervention; Chronic disease management; Hemodialysis; Dialysis quality

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## 1. Introduction

Maintenance hemodialysis (MHD) is a treatment modality often used for patients with end-stage renal disease <sup>[1]</sup>. Although long-term MHD treatment can effectively alleviate the symptoms of the disease, it can also lead to complications such as microinflammatory reactions, calcium and phosphorus metabolism disorders, and cardiovascular diseases <sup>[2]</sup>. This not only exacerbates the decline in patients' quality of life but also produces negative emotions <sup>[3]</sup>. Currently, routine nursing services are given to patients in the clinic while they are receiving MHD, but as routine nursing is often task-oriented and lacks a targeted and personalized management model, it results in poor nursing outcomes <sup>[4]</sup>. Therefore, it is important to seek new nursing management and intervention models for patients undergoing MHD. The chronic disease management model is a multidisciplinary collaborative approach that can proactively, continuously, and comprehensively provide systematic service support for patients, thereby promoting patient health, prolonging life, and reducing complication rates <sup>[5]</sup>. Specialty nurses are expert clinical nurses with a high level of expertise in a certain nursing field and a strong ability to practice clinical knowledge to teach, guide, and consult <sup>[6]</sup>. This paper focuses on the impact of the chronic disease management intervention model led by specialty nurses on the quality of care and satisfaction of maintenance hemodialysis patients.

## 2. General information and methodology

### 2.1. General information

72 patients who received MHD treatment in our hospital from June 2021 to March 2022 were selected, including 43 males and 29 females; aged 34–81 years old, with a mean of  $60.00 \pm 11.64$  years old; the duration of the disease was 1–21 years, with a mean of  $4.79 \pm 3.98$  years; in terms of disease type, there were 35 cases of hypertensive nephropathy, 16 cases of diabetic nephropathy, 13 cases of chronic nephritis and renal insufficiency, and 8 cases of polycystic kidney; the dialysis time was 6–250 months. The data of this group of patients in the same period of last year were reviewed. The study was approved by the Ethics Committee of our hospital (Ethics Approval No. 2022-KY-014-1), and the patients gave informed consent.

Inclusion criteria: disease diagnosis was referred to the criteria of nephrology <sup>[3]</sup>, and the diagnosis of end-stage renal disease was confirmed by laboratory and other tests; the time of dialysis was more than 3 months, the frequency of dialysis was 2–3 times/week, the length of dialysis was 4 hours/time, and the frequency of hemodialysis filtration was  $> 4$  times/month; gastrointestinal function and thyroid function are normal; no recent major surgery.

Exclusion criteria: patients receiving peritoneal dialysis; primary hyperparathyroidism, liver and gallbladder diseases, multiple myeloma, bone metastases, and hematological diseases; combined with other important organ insufficiencies; transferred to other hospitals for dialysis during the study period; others such as patients with cognitive-communication disorders, and other psychiatric disorders <sup>[4]</sup>.

### 2.2. Methodology

The specific implementation content is as follows.

- (1) File management: Personal health records were established and improved.
- (2) Dialysis follow-up management: Specialist nurses regularly followed up with patients, at least once a month, to understand the treatment mode of the patients under their care, dialysis frequency, dry weight adjustment, the use of anticoagulant drugs, etc., the assessment of the function of the endocardial fistula for endocardial fistula patients, according to the planned puncture. Patients with indwelling catheters mastered basic home care skills, etc., and filled in the records carefully.

- (3) Nutritional management: Daily dietary situation was analyzed to strengthen the awareness of rational nutritional diet and avoid unfavorable factors. Using the multidisciplinary cooperation platform in the hospital, nurses carried out nutritional management of patients, adopted a professional nutritional screening scale to assess the nutritional status of patients, and formulated dietary plans.
- (4) Psychological aspects of dialysis: Through daily communication and initiative, nurses understood the emotional status of patients, such as patients with depressed mood, sleep disorders, etc., and provided timely psychological guidance to help patients correctly recognize and positively face the disease, reduce the fear of psychology, and improve treatment adherence.
- (5) Dialysis intervals management: Nurses regularly tested the indicators according to the standard requirements. Safe and effective treatments were given for various acute and chronic complications promptly. Utilizing the WeChat platform, patients' special dialysis situation on the same day was well handed over.
- (6) Engineering team: Nurses were responsible for the sterilization, repair, and maintenance of equipment, and monitoring the quality of dialysis fluid and dialysis water according to the annual work plan.

### 2.3. Observation indexes

- (1) Dialysis adequacy and nutritional indexes: Before and after the nursing intervention, blood specimens of patients were collected to test the levels of blood calcium, blood phosphorus, blood potassium, alkaline phosphatase (ALP), blood albumin (ALB), hemoglobin (HB), parathyroid hormone (PTH), and  $\beta$ 2-microglobulin ( $\beta$ 2-MG). The blood creatinine and urea nitrogen levels were detected using the internationally recognized Kt/V evaluation index, which was calculated using the Douglas formula:  $Kt/V = -\ln(R - 0.008 \times t) + (4 - 3.5 \times R) \times UF/W$ , where Ln is the natural logarithm, R is the ratio of post-dialysis urea nitrogen to pre-dialysis urea nitrogen, t is the time of dialysis (h), UF is the amount of ultrafiltration (L), and W is the post-dialysis body mass (kg)<sup>[7]</sup>. The values of urea reduction rate (URR) and urea clearance (Kt/V) were calculated.  $URR > 60\%$  and  $Kt/V > 1.2 \sim 1.4$  indicated that the hemodialysis was effective, and the higher the levels of URR and Kt/V and the lower the level of  $\beta$ 2-MG indicated that the patients were more sufficiently dialyzed.
- (2) Occurrence of adverse injury: Patients' vascular access malfunction was recorded in 6 months before and after the intervention, such as stenosis, thrombosis, infection, cleft tube, etc., as well as the occurrence of cardiac insufficiency, intradialytic hypotension (IDH), hypertension, imbalance syndrome, allergy, and so on.
- (3) Nursing satisfaction: The Newcastle Nursing Service Satisfaction Scale (NSNS)<sup>[8]</sup> was used to measure satisfaction with nursing care before and after the intervention, with a total of 19 entries on a 5-point scale from 19 to 95, with scores of 19 to 37 as very dissatisfied, 38 to 56 as dissatisfied, 57 to 75 as average, 76 to 94 as satisfied, and 95 as very satisfied, and very satisfied and satisfied were included in the total satisfaction.
- (4) Psychological status: Patients' psychological status before and after nursing care was assessed using the Self-Anxiety Scale (SAS score) and the Self-Depression Scale (SDS score). The cut-off value of the SAS score was 50 points, and the cut-off value of the SDS score was 53 points, and the higher the score, the more serious the negative emotions of the patients.

### 2.4. Statistical methods

The data were statistically analyzed using SPSS20.0 software, and the measurement data were expressed as mean  $\pm$  standard deviation (SD), using the *t*-test; the qualitative data were tested using the  $\chi^2$  test; and the

difference was considered statistically significant at  $P < 0.05$ .

### 3. Results

#### 3.1. Comparison of dialysis adequacy indexes before and after nursing intervention

Compared with pre-intervention and after 24 weeks of intervention URR and Kt/V (%) were improved but not statistically different ( $P > 0.05$ ), but  $\beta$ 2-MG was statistically different ( $P < 0.05$ ), as shown in **Table 1**.

**Table 1.** Comparison of dialysis adequacy indicators before and after patient care interventions

Time	URR (%)	Kt/V (%)	$\beta$ 2-MG (mg/L)
Pre-intervention	71.27 $\pm$ 10.58	1.44 $\pm$ 0.45	32.33 $\pm$ 3.60
Post-intervention	71.31 $\pm$ 9.24	1.44 $\pm$ 0.38	31.18 $\pm$ 4.06*
<i>t</i>	0.0034	0.0774	2.0470
<i>P</i>	> 0.05	> 0.05	< 0.05

#### 3.2. Comparison of mineral metabolism and nutritional status before and after nursing intervention

Compared with the pre-intervention, after 24 weeks of intervention, the blood calcium, PTH, and blood potassium levels decreased insignificantly ( $P > 0.05$ ), blood phosphorus levels decreased significantly compared with the pre-intervention ( $P < 0.01$ ), ALB and HB levels were elevated and were significantly better than the pre-intervention ( $P < 0.05$ ), as presented in **Table 2**.

**Table 2.** Comparison of mineral metabolism and nutritional status of patients before and after nursing interventions ( $n = 72$ )

Time	Calcium (mmol/L)	Blood phosphorus (mmol/L)	Blood potassium (mmol/L)	PTH (pg/mL)	ALP (U/L)	ALB (g/L)	HB (g/L)
Pre-intervention	2.21 $\pm$ 0.22	1.82 $\pm$ 0.57	4.88 $\pm$ 0.71	356.73 $\pm$ 369.55	113.91 $\pm$ 74.05	38.12 $\pm$ 3.11	99.69 $\pm$ 18.99
Post-intervention	2.21 $\pm$ 0.24	1.62 $\pm$ 0.44**	4.97 $\pm$ 0.77	392.29 $\pm$ 435.25	112.22 $\pm$ 72.34	39.49 $\pm$ 4.92*	108.36 $\pm$ 18.83*
<i>t</i>	0.015	3.1369	0.8857	0.8739	0.50	2.2501	2.1275
<i>P</i>	> 0.05	< 0.01	> 0.05	> 0.05	> 0.05	< 0.05	< 0.05

#### 3.3. Comparison of complications before and after intervention

Compared with the pre-intervention, the incidence of IDH and hypertension after 24 weeks of intervention was lower than the pre-intervention with a statistical difference ( $P < 0.05$ ), and the total incidence of adverse events was significantly lower than the pre-intervention with a statistical difference ( $P < 0.01$ ), as demonstrated in **Table 3**.

#### 3.4. Comparison of SAS and SDS scores before and after intervention

Compared with the pre-intervention, there was no significant difference in the SDS score after 24 weeks of intervention ( $P > 0.05$ ), and the SAS score was significantly lower and better than before the intervention ( $P < 0.01$ ) (**Table 4**).

### 3.5. Comparison of patient satisfaction before and after intervention

A total of 72 satisfaction questionnaires were distributed, with 68 valid questionnaires retrieved. After 24 weeks of intervention, patient satisfaction was greatly improved, with statistical differences ( $P < 0.05$ ) (Table 5).

**Table 3.** Comparison of complications before and after nursing interventions (%),  $n = 72$

Time	Malfunction	Cardiac insufficiency	IDH	Hypertension	Other	Total incidence
Pre-intervention	2 (4.44)	1 (2.22)	18 (40.00)	17 (35.56)	2 (4.44)	40 (88.89)
Post-intervention	1 (2.22)	2 (4.44)	9 (20.00)*	8 (17.78)*	3 (6.67)	23 (51.11)**
$\chi^2$	0.0000	0.0000	4.2857	4.4862	0.0000	15.2910
$P$	> 0.05	> 0.05	< 0.05	< 0.05	> 0.05	< 0.01

**Table 4.** Comparison of psychological status before and after intervention ( $n = 72$ )

Time	SAS score/points	SDS score/point
Pre-intervention	47.69 ± 6.55	51.86 ± 10.61
Post-intervention	43.92 ± 6.82	50.38 ± 10.97
$t$	3.3811	0.8245
$P$	< 0.01	> 0.05

**Table 5.** Comparison of nursing satisfaction before and after nursing intervention (%),  $n = 72$

Time	Very satisfied	Satisfied	Average	Dissatisfied	Very dissatisfied	Total satisfaction
Pre-intervention	5 (7.35)	38 (55.88)	22 (32.35)	3 (4.41)	0 (0.00)	63.24%
Post-intervention	12 (17.65)	43 (63.24)	13 (19.12)	0 (0.00)	0 (0.00)	80.88%*
$\chi^2$						5.2589
$P$						< 0.05

## 4. Discussion

Maintenance hemodialysis is an important therapeutic modality in the clinical treatment of end-stage renal disease, which can not only maintain the acid-base balance and correct the water-electrolyte disorders, but also remove metabolic wastes from the body. However, long-term patients with MHD are prone to a variety of dialysis-related complications, which lead to physiological and psychological problems, thus affecting the patient's overall therapeutic effect and quality of life [1,8,9]. Nursing care, as an important part of the MHD process, is particularly important in improving patient outcomes. However, the current conventional nursing care usually lacks the targeted and personalized management mode, and the nursing staff's own management and service consciousness is poor, which makes the intervention effect unsatisfactory [4]. Therefore, in order to ensure the therapeutic effect of MHD patients and prevent complications, it is of great significance to adopt new nursing management and intervention models.

In recent years, the chronic disease management model has been widely used in the management of chronic diseases, which can effectively reduce the incidence of disease-related complications [10]. Studies have shown

that the nursing model contributes to the long-term management of chronic diseases. As reported by Lu *et al.* <sup>[11]</sup>, the “nursing assistance via the internet” model led by specialist nurses can meet the diversified and specialized home care needs of the elderly chronic disease population and reduce patients’ readmission rates. In this study, we used a nurse specialist-led chronic disease management model to observe the effects of nursing interventions for patients with MHD. The results of the study showed that after the intervention, the dialysis adequacy index of the patients increased and the  $\beta$ 2-MG level decreased significantly, indicating that the dialysis of the patients was more adequate and the degree of renal injury was reduced after the intervention. In addition, we found that mineral metabolism and nutritional status increased more significantly after 24 weeks of intervention, indicating that regular nutritional status assessment can realize dynamic nutritional intervention for patients, and adjusting the nutritional intervention program through the assessment results can effectively improve the malnutrition status of MHD patients.

The occurrence of cardiovascular disease is a common complication in MHD patients <sup>[2]</sup>. This study found that there was no significant improvement in cardiac insufficiency in patients before and after the intervention, which was considered to be related to the lack of patient compliance and insufficient attention, but the incidence of IDH and hypertension in patients was significantly reduced, indicating that timely nursing intervention can provide early warning of the occurrence of IDH and hypertension, and active measures can be taken to reduce the incidence of IDH and hypertension in patients as well as avoid the related physiological damage. The patients were able to complete dialysis successfully, and the satisfaction was greatly increased to 80.88% after the intervention. In addition, some patients experience anxiety, depression, and sadness because of uncertainty about the disease, aggravation of the disease, complications caused by the disease, and the appearance of abnormal clinical symptoms. It is important to allow patients to transform negative psychology, correct wrong thinking, enhance patients’ self-confidence as well as psychological adjustment ability, and provide patients with opportunities to communicate with their doctors. The results of this study showed that there was no significant difference in SDS scores before and after the intervention, and SAS scores were significantly lower and better than before the intervention, which shows that this management method can improve patients’ negative psychology, but it still needs to be further explored.

## 5. Conclusion

In conclusion, the chronic disease management intervention model led by specialized nurses can improve the quality of care for MHD patients and increase patients’ satisfaction with care, which can help to enhance their quality of life.

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## Disclosure statement

The authors declare no conflict of interest.

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