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2025 Volume 10, Issue 4
Journal of Medicines Development Sciences
ISSN: 2382-6371(Online) ISSN: 2382-6363(Print)

The Application Effect and Analysis of Fogg Behavioral Model Medication Reminder Nursing in Patients with Stage 3-4 Chronic Kidney Disease

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Abstract: *Objective:* To explore the application effect of Fogg behavioral model medication reminder nursing in patients with stage 3-4 chronic kidney disease and its impact on medication compliance. *Methods:* Select outpatient and inpatient chronic kidney disease stage 3-4 patients in our hospital from 2023.7 to 2024.7, with a total sample size of 70 cases. They were divided into groups using the ball-touching method and carried out different clinical nursing methods. There were 35 cases in both the control group and the observation group. The corresponding nursing plans were routine nursing and Fogg behavioral model medication reminder nursing. *Results:* Medication compliance in the observation group (93.33%) was higher than that in the control group (70.00%), P<0.05. The differences in renal function indicators between the groups were small at the time of enrollment. After care, the serum creatinine and urea nitrogen in the observation group were lower than those in the control group, P<0.05. The difference in negative emotions between the groups was small at the time of enrollment. After nursing, the SAS score and SDS score of the observation group were lower than those of the control group, P<0.05. The difference in self-efficacy between groups was small at the time of enrollment, and the GSES score after care in the observation group was lower than that in the control group, P<0.05. *Conclusion:* Applying the Fogg behavioral model for medication reminder care in patients with stage 3-4 chronic kidney disease has significant value in improving patients' medication compliance and self-efficacy, promoting improvement in renal function indicators, and alleviating patients' negative emotions.

Keywords: Chronic kidney disease; Fogg behavioral model medication reminder care; Compliance; Renal function indicators; Self-efficacy; Negative emotions

Online publication: December 26, 2025

1. Introduction

Chronic kidney disease is a major global public health problem. Its progression can lead to irreversible renal function damage. In severe cases, it can enter end-stage renal failure and require renal replacement therapy. It seriously threatens human health and brings heavy economic burden, life and psychological pressure to patients. In order to delay the decline of renal function and reduce the occurrence of complications, we must achieve early detection, early diagnosis, and early treatment of this disease. The principle of treatment is to adjust lifestyle, actively treat the primary disease, and avoid aggravating factors, among which standardized medication is the key link. Comprehensive treatment measures plus regular

medication as prescribed by the doctor can effectively stabilize the patient's condition. However, in clinical practice, due to the low level of awareness of the disease among adult patients with chronic kidney disease in my country, and the vast majority of patients need to take multiple drugs for a long time, complex medication regimens and insufficient awareness of the disease lead to frequent missed or incorrect doses of drugs [1]. Some patients even think that they have a certain understanding of disease treatment during the long-term treatment process and thus add, reduce or stop medication on their own. Poor medication compliance directly affects treatment efficacy and disease prognosis. The traditional nursing model focuses on knowledge instillation and simple reminders, making it difficult to form a lasting medication habit [2]. Intervention strategies based on behavior change theory have become a new direction to solve this problem. The Fogg behavioral model provides a scientific framework for establishing stable medication behavior by systematically designing the three elements of motivation, ability improvement and triggering mechanism [3]. This study compares the practical effects of routine nursing and Fogg behavioral model medication reminder nursing, explores more effective medication management plans for patients with chronic kidney disease, and provides theoretical basis and practical guidance for clinical nursing work.

2. Materials and methods

2.1. General information

A total of 70 patients with stage 3-4 chronic kidney disease who were in the nephrology outpatient or hospitalized in our hospital from 2023.7 to 2024.7 were selected. The samples were equally divided into two groups (35 cases/group), the control group and the observation group (35 cases/group) using the ball-touching method. The control group included 20 men and 15 women; the age threshold was 40-75 years old, and the mean was (56.70±6.57) years old. The observation group included 21 males and 14 females; the age threshold was 42-75 years old, and the mean was (57.25±6.33) years old. The baseline data of the two groups were balanced, P>0.05.

Inclusion criteria: ① Patients with stage 3-4 chronic kidney disease who meet the diagnostic criteria of KDIGO guidelines; ② Aged 40-75 years old and have basic reading, writing and communication skills; ③ Need to take 3 or more kidney disease-related drugs for a long time; have normal cognitive function, MMSE score ≥ 24 points; ④ voluntarily participate in the study and sign an informed consent form; ⑤ be able to skillfully use mobile devices such as smartphones; ⑥ expected survival time is more than 6 months. Exclusion criteria: ① Patients with acute attacks of severe cardiovascular and cerebrovascular diseases; ② People with mental illness or cognitive dysfunction; ③ People with advanced malignant tumors or life expectancy of less than 6 months; ④ People who have recently participated in other clinical trials; ⑤ People with severe visual and auditory impairments that affect communication; ⑥ People who plan to undergo renal replacement therapy in the short term; ⑦ People who take drugs contraindicated in the trial.

2.2. Method

The control group received routine care, distributed chronic kidney disease knowledge manuals, carried out collective and one-to-one health education, explained disease characteristics and medication principles, and detailed drug names, dosages, usage and precautions; established follow-up files, made appointments for follow-up visits and reminded review indicators, provided basic suggestions such as diet, exercise, work and rest, answered patients' questions on a regular basis, provided necessary comfort, and provided department contact numbers to deal with emergencies.

The observation group implemented Fogg behavioral model medication reminder care based on the control group:

(1) Motivation: The nursing team demonstrates the pathophysiological process of chronic kidney disease to patients through a variety of health education methods and channels, with special emphasis on the key role of standardized medication in delaying the deterioration of renal function, and helps patients understand the clinical significance of drug intervention. Regularly organize patient exchange meetings, invite patients with good treatment effects and good compliance to share their experiences, and enhance patients' confidence in treatment through peer

education. Establish a personal health record tracking system so that patients can check the correlation between their own indicator change trends and medication records at any time, strengthen positive feedback on behavioral results, and design differentiated educational materials for patients with different educational levels to ensure the effectiveness of information transmission.

(2) Ability improvement: In order to reduce the difficulty of medication-taking behavior, systematic support measures are implemented. Each patient is equipped with a smart pill box, which has time-period reminders, dose display and missed dose alarm functions. Nursing staff instruct patients to place the pill box in a high-frequency area of daily activity, such as the bedside or dining table. Develop a mobile medication management application and set up a three-level reminder mechanism, including push notifications, text message reminders and family collaborative reminders.

(3) Trigger mechanism: Set up visual reminder points in the patient's living environment, such as bathroom mirrors, refrigerator doors, dining tables, bedside tables, etc., and post personalized medication reminder notes to establish conditioned reflexes between medication behavior and daily habits, such as instructing patients to take medication immediately after brushing their teeth in the morning, taking medication half an hour after a meal, and going to bed to take medication 1 hour before going to bed. Establish a patient mutual aid group, implement a daily medication check-in system, use group pressure to form behavioral constraints, and update reminder strategies every month to prevent patients from adapting to fixed reminder methods.

(4) Effect enhancement: Establish a dynamic evaluation and feedback mechanism to continuously optimize the intervention effect. Generate personal medication compliance reports every week, record in detail key indicators such as the accuracy of medication time and the number of missed doses, and present them side by side with the trend of changes in kidney function. A phased reward plan is implemented to reward patients with continuous and standardized medication with health points. The points can be exchanged for rights such as priority medical treatment. Face-to-face follow-up is conducted every two weeks, and the reminder method and intensity are adjusted based on patient feedback.

2.3. Observation indicators

(1) Evaluate the medication compliance of the two groups and define them as complete compliance, basic compliance and non-compliance based on the patients' complete cooperation, cooperation after comfort and non-cooperation.

(2) Measure the serum creatinine and urea nitrogen indicators of the two groups before the intervention and 1 year after the intervention.

(3) The Self-Rating Anxiety and Depression Scale (SAS, SDS) assesses negative emotions. The higher the score, the more serious the negative emotions.

(4) Self-efficacy (GSES) scale: evaluated from the three dimensions of innovation self-efficacy, persuasion self-efficacy and adaptability self-efficacy. The total score is 40 points. The higher the score, the higher the self-efficacy of the elderly.

2.4. Statistical methods

The calculation software used for relevant data is SPSS26.0. Renal function indicators, negative emotion scores, and self-efficacy scores are measurement data, and medication compliance is counting data. The former is described with ($\bar{x} \pm s$) and tested with t value; the latter is described by frequency and composition ratio, and x^2 test. $P<0.05$ is statistically significant.

3. Results

3.1. Compare the clinical medication compliance of the two groups

Medication compliance in the observation group (93.33%) was higher than that in the control group (70.00%), $P<0.05$. See

Table 1 for details.

Table 1. Comparison of compliance between the two groups (n/%)

Group	n	Complete compliance	Basic compliance	Noncompliance	Compliance
Control group	35	15(42.86)	12(34.29)	8(22.86)	27(77.14)
Observation group	35	23(65.71)	10(28.57)	2(5.71)	33(94.29)
x^2 false	--	--	--	--	4.2000
P	--	--	--	--	0.0404

3.2. Compare the renal function indicators between the two groups before and after intervention

The differences in renal function indicators between the groups were small at the time of enrollment. After care, the serum creatinine and urea nitrogen in the observation group were lower than those in the control group, P<0.05. See **Table 2** for details.

Table 2. Comparison of renal function indicators ($\bar{x} \pm s$)

Group	n	Serum creatinine (umol/L)		Urea nitrogen (mmol/L)	
		Before intervention	After intervention	Before intervention	After intervention
Control group	35	160.37±18.25	155.29±17.63	8.72±2.16	8.65±2.03
Observation group	35	159.84±17.96	132.46±15.27	8.92±2.24	7.13±1.85
t	--	0.123	5.791	0.380	3.274
P	--	0.903	0.000	0.705	0.002

3.3. Compare the negative emotion scores of the two groups before and after intervention

The difference in negative emotions between the groups was small at the time of enrollment. After nursing, the SAS score and SDS score of the observation group were lower than those of the control group, P<0.05. See **Table 3** for details.

Table 3. Comparison of negative emotion scores ($\bar{x} \pm s$)

Group	n	SAS score (points)		SDS score (points)	
		Before intervention	After intervention	Before intervention	After intervention
Control group	35	57.52±6.35	51.33±6.28	53.84±5.75	49.28±5.63
Observation group	35	57.75±6.23	48.23±5.85	54.02±6.07	45.12±6.54
t	--	0.153	2.137	0.127	2.852
P	--	0.879	0.036	0.899	0.006

3.4. Compare the self-efficacy scores of the two groups before and after the intervention

The difference in self-efficacy between groups was small at the time of enrollment, and the GSES score after care in the observation group was lower than that in the control group, P<0.05. See **Table 4** for details.

Table 4. Comparison of self-efficacy GSES scores ($\bar{x} \pm s$)

Group	n	Innovation		Persuade		Strain		Total score	
		Before care	After care	Before care	After care	Before care	After care	Before care	After care
Control group	35	6.04±1.17	7.66±1.58	7.13±1.56	9.84±1.92	6.82±1.32	9.64±2.17	19.99±3.17	27.14±4.58
Observation group	35	5.83±1.20	8.73±1.04	7.20±1.77	10.75±1.26	6.63±1.34	11.10±1.85	19.66±2.20	30.58±5.40
t	--	0.741	3.347	0.176	2.344	0.598	3.029	0.506	2.874
P	--	0.461	0.001	0.861	0.022	0.552	0.004	0.615	0.005

4. Discussion

Chronic kidney disease has the characteristics of long course, many complications, and complex treatment. Patients need long-term standardized medication to control the progression of the disease. The metabolic disorders and symptom distress caused by the disease itself, coupled with the complex medication regimen, cause significant psychological and behavioral burdens on patients [4]. The core problem facing clinical nursing is how to help patients establish and maintain good medication habits. Traditional nursing methods have obvious limitations in sustained behavioral changes, and there is an urgent need to introduce more scientific behavioral intervention strategies [5]. The Fogg behavioral model medication reminder care is a systematic intervention program based on behavioral design. Its core purpose is to promote the continued stability of target behaviors by optimizing the conditions for behavior occurrence [6]. This model believes that behavior change requires the simultaneous possession of three elements: motivation, ability and trigger. In clinical practice, multi-channel and multi-method health education, peer demonstration and health feedback are used to enhance motivation to take medication; tools such as smart pill boxes and mobile applications are used to reduce the difficulty of behavioral execution; strategies such as environmental prompts and habit bundling are used to establish a stable triggering mechanism [7]. Compared with the traditional nursing model, the advantage of this program is that it integrates scattered intervention measures into an organic system to form a virtuous cycle of behavior change. Through continuous effect feedback and behavior reinforcement, it helps patients transform passive medication into an automated behavior pattern. It fully takes into account the psychological and behavioral characteristics of patients with chronic diseases and achieves a full-process intervention from cognition to behavior [8].

The results showed that the medication compliance in the observation group (93.33%) was higher than that in the control group (70.00%), P<0.05. The differences in renal function indicators between the groups were small at the time of enrollment. After care, the serum creatinine and urea nitrogen in the observation group were lower than those in the control group, P<0.05. The difference in negative emotions between the groups was small at the time of enrollment. After nursing, the SAS score and SDS score of the observation group were lower than those of the control group, P<0.05. The difference in self-efficacy between groups was small at the time of enrollment, and the GSES score after care in the observation group was lower than that in the control group, P<0.05. The Fogg behavioral model systematically intervenes in the mechanism of medication-taking behavior. The motivational stimulation module effectively improves patients' awareness of the value of medication and forms internal driving force; the ability improvement module solves operational obstacles in the actual medication-taking process through technical means; the triggering mechanism establishes a stable behavioral prompt system to reduce memory dependence; the continuous feedback and positive incentives of the effect enhancement module consolidate the results of behavior change [9]. This multi-dimensional, personalized intervention method is more capable of forming lasting behavioral changes than single knowledge education or simple reminders[10]. Based on the characteristics of patients with chronic kidney disease, this program exerts a comprehensive effect in reducing cognitive load, establishing

behavioral cues, and strengthening behavioral outcomes, ultimately achieving better clinical outcomes.

In summary, the application of the Fogg behavioral model for medication reminder care in patients with chronic kidney disease has significant value in improving patients' medication compliance and self-efficacy, promoting the improvement of their renal function indicators, and alleviating patients' negative emotions.

Disclosure statement

The author declares no conflict of interest.

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