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WeChat peer education on self-management behavior of hemodialysis patients

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Abstract

This paper investigates the impact of WeChat peer education on the self-management ability of maintenance hemodialysis (MHD) patients, evaluating its intervention effect on interdialysis self-management behavior. Conducted in a Grade-III hospital in Wuhan from January to December 2022, MHD patients were randomly assigned to intervention (WeChat peer education + bedside health education) and control (bedside health education only) groups, with 70 patients in each. A 3-month pre-test preceded the formal study, and data were collected before and after a 6-month intervention. The intervention group demonstrated significant improvements in self-management behavior scale scores, particularly in the "performing self-care" dimension, registering a 0.87-point increase compared to pre-intervention levels. The sample loss rate was 4.3%, with 134 MHD patients participating throughout the intervention. General data, including gender, age, dialysis time, and underlying diseases, showed no statistical differences between groups pre-intervention ($P>0.05$). WeChat peer education proved effective in enhancing self-efficacy and disease self-management ability, surpassing the control group. This study establishes the feasibility and efficacy of implementing WeChat peer education for MHD patients, providing valuable insights into improving patient outcomes in hemodialysis care.

Keywords: WeChat, hemodialysis, peer education, self-management, behavior

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1. Introduction

Chronic kidney disease (CKD) is a serious disease affecting public health, which has the characteristics of long course, high cost and complicated treatment. The ultimate outcome of CKD is the development of End-stage renal disease (ESRD), and the best treatment for patients with ESRD is Renal replacement therapy (RRT). In recent years, the number of patients with ESRD caused by chronic nephritis, hypertension, diabetes, arteriosclerosis and other diseases has been on the rise, resulting in the number of patients receiving RRT treatment increasing at a rate of more than 11% year by year (An Yu et al., 2018).At present, the main RRT methods for ESRD patients are kidney transplantation, peritoneal dialysis and hemodialysis. Peritoneal dialysis requires more treatment conditions for patients at home, many patients are restricted by conditions, and the cost of kidney transplantation is high. In addition, rejection after kidney transplantation is common in patients. Therefore, the RRT that most ESRD patients choose to maintain their lives is Maintenance hemodialysis (MHD), which can prolong the survival time, improve the quality of life and reduce the fatality rate.

Although MHD can improve the symptoms of end-stage renal failure and prolong the survival of patients, it cannot replace the complex endocrine and metabolic functions of normal human kidneys. MHD can only selectively remove part of toxins and cannot completely replace the function of normal kidneys. After long-term dialysis, patients will have many complications. It has a great impact on patient prognosis (Jaques & Davenport, 2021).Due to the poor self-management ability of MHD patients, their inability to work and live normally due to the longtime of commuting to the hospital for dialysis treatment, and the need for others to take care of them, the family role has also changed, and with the reduction of social interaction, the social support has also decreased, and the patients have been subjected to multiple pressures for a long time, the psychological balance has been damaged, and many negative emotions have appeared. Resulting in a severe decline in their quality of life. To get effective treatment, patients not only need to go to dialysis on time, but also must improve their self-management ability. It is urgent to explore a set of effective interventions to improve the self-management ability of MHD patients.

It is an effective way to guide and intervene the life style of patients, but the existing health education mostly involves face-to-face preaching with patients in the process of dialysis, holding doctor-patient seminars, telephone visits, home visits, etc. In the traditional education dominated by lectures from medical staff, the most important thing in the education process is the management of diseases, and patients can only passively listen. When patients undergo dialysis, the responsible nurse verbally narrates disease-related knowledge or disseminates educational materials to patients. With the end of dialysis, health education also ends, and patients leave the dialysis center without continuous supervision and guidance, patients' compliance behavior is difficult to change, and treatment compliance is difficult to achieve (Zhao Yan, 2020).The literature review at home and abroad proves that knowledge transfer is very important, but patients' cognition and inner feelings about the disease are ignored, and it is difficult for patients to actively change their lifestyle and compliance behavior. Moreover, with the passage of time and changes, patients will gradually have vague memories or even forget the knowledge instilled and conveyed, and they are often reluctant to take the initiative to consult. Leading to a return to the previous lifestyle (Lu Chunhong et al., 2020).

Social learning theory research shows that people with similar experiences or facing common problems and concerns can communicate cognitive behavior, psychological emotions, inner feelings and share knowledge, resources and information together, which can positively influence each other and change their own behavior. Peer Education (PE) is one such way to achieve common health (Ebrahimi et al., 2021).Compared with other educational methods, peer education has a natural educational process, reliable information sources, diverse educational contents, more acceptable words and deeds, better results, lower costs, stronger influence effects,

and common progress (Davey-Rothwellh et al., 2021).Peer education can achieve good health education by sharing ideas, exchanging experiences and knowledge with specific groups, and passing on health concepts and knowledge to each other. Initially, it is used in the field of teaching, and gradually expands its application fields with continuous development, making good progress in the field of care for patients with chronic diseases (Jia Qi & Li Ming Jin, 2019). Studies have shown that peer education for patients with chronic diseases can not only effectively improve the self-management level of patients, but also improve the quality of life of patients, which is an effective health education method (Han Minghui et al., 2018).

With the rapid development of mobile communication technology, mobile phones have been integrated into people's lives and become a portable communication tool. WeChat is a mobile phone application software launched by Tencent in 2011. It can be used to send instant information such as pictures, videos, texts, voices, links, files, etc. It has obvious advantages of information, intelligence, modernization, etc., and is widely used in daily life. In China, WeChat has become the preferred communication platform for people. In addition, WeChat is not only a social networking tool, but also an important platform for people to receive all kinds of information. Using WeChat can avoid all kinds of invariance and troubles caused by close communication. Compared with traditional face-to-face health preaching, doctor-patient symposiums and telephone follow-up visits, WeChat peer education can break through the limitations of time and space, easily and quickly share ideas, exchange experiences and knowledge with specific groups, and convey health knowledge to patients with pictures and pictures. It not only realizes instant education at any time (Meng Song, 2020), but also provides patients with a good platform for communication and communication, which can not only avoid cross-infection caused by close communication between each other, but also achieve unified and diversified information transmission on the basis of breaking through time and space, so that patients can learn from each other, supervise each other, support each other, and change from passive to active. Jointly improve the understanding of the disease, improve patients' self-management awareness and level, promote patients to change their life concepts and ways, promote the outcome of the disease, improve the quality of life, and prolong the life of patients.

Objectives of the Study - Starting from sociology, pedagogy, psychology, nursing and other disciplines, the influence of WeChat peer education on the self-management ability of maintenance hemodialysis patients was discussed from different perspectives and dimensions, and the intervention effect of WeChat peer education on improving the self-management ability of MHD patients was evaluated, so as to verify the effectiveness and feasibility of implementing WeChat peer education for maintenance hemodialysis patients.

2. Methods

Research Design - A randomized controlled trial design was used in this study. According to the convenient sampling method, the patients who received MHD treatment in the blood purification center of a tertiary hospital in Wuhan from January 2022 to December 2022 were selected. Patients were divided into intervention group and control group by random number table method.

Participants of the Study - Samples were selected in strict accordance with inclusion and exclusion criteria, and patients could only conduct the study after giving informed consent and voluntarily filling in the informed consent form**. Inclusion Criteria**: Patients aged ≥18 years, diagnosed with end-stage renal disease and undergoing maintenance hemodialysis; MHD patients with 24-hour total urine volume less than 400ml, oliguria or anuria; The condition is relatively stable and has been receiving regular MHD treatment for at least 3 months (dialysis 3 times a week, 4 hours each time); Patients are aware of and voluntarily participate in this study, fill in the informed consent, and they or their family members can use WeChat. **Exclusion Criteria**: Patients who are preparing for kidney transplantation or other operations in the near future; patients with serious diseases of multiple systems and unstable conditions; patients with mental illness or cognitive behavioral disorder, abnormal hearing or vision; patients who are bedridden for a long time and unable to cooperate with the study; the person or the main escort does not have a smart phone or Internet connection. **Criteria for culling and shedding**: If the patients receive kidney transplantation or transfer to peritoneal dialysis, transfer to hospital, critically ill and hospitalized, or die

during the study period, or do not cooperate with the study, they will be removed from the study.

Data Gathering Instrument - After reading a large number of relevant literatures at home and abroad, the researcher designed the general data table of the patients to observe and record the basic information of the patients, including the general demographic information of the patients, such as age, gender, educational level, economic income, employment, marital status, medical insurance, and religious belief; And the characteristics of the disease, such as dry weight, residual urine volume, primary disease, dialysis time, dialysis complications, etc.

Song Yijun, a scholar from Taiwan, developed the self-management Scale for Hemodialysis patients (SMSH) in 2009, which will observe and measure the self-management behaviors of hemodialysis patients, and the content will consist of 20 items. It is divided into four dimensions: problem solving includes 5 items, including items 1, 2, 6, 7 and 12; The implementation of self-care includes 7 items 3, 4, 5, 8, 9, 10, 16, etc. In terms of partnership, there are 4 items, such as 11, 14, 15 and 19. Emotional processing includes 4 items 13, 17, 18, 20, etc. This scale uses Likert 4-level scoring method. Each item has 4 options: never, occasionally, often and always. The score is l, 2, 3 and 4 respectively. The total score ranges from 20 to 80 points. Because the number of entries in each dimension is not the same, the average score for each dimension needs to be calculated in order to facilitate comparison, which is calculated by dividing the total score of all entries in this dimension by the total number of entries in this dimension. Domestic scholar Li Hui (2011) improved and revised this scale, and Cronbach's α value was 0. 813.Cronbach's α values in the four dimensions are: Cronbach's α value was 0.846 for problem solving, 0.825 for emotional processing, 0.738 for self-care and 0.622 for partnership. This scale is currently the authoritative scale to evaluate the self-management ability of MHD patients.

Data Gathering Procedure - In order to ensure the safety of hemodialysis patients, their families and medical staff, standardized health education for maintenance hemodialysis patients was conducted according to relevant guidelines and regulations, the epidemic situation and the actual situation of the department. The intervention methods formulated for the control group and the intervention group were as follows.

Control group:

Bedside health education should be given to patients during dialysis, and health education cards and manuals should be issued to patients. Health display boards are placed in the waiting area of patients in the department, and the health publicity board regularly changes the health knowledge and pictures related to hemodialysis. Health education includes drugs, diet, exercise and other aspects. It is necessary to explain to patients what is dry weight, the calculation method of interdialysis weight gain, the significance of interdialysis weight gain/dry weight ratio and the standard value. It is easy to tell patients how much water content is contained in various foods and how to remove water contained in foods. Give the patient a food conversion chart and teach the patient how to use it. Teach patients how to measure their weight correctly, guide them to accurately record their daily dietary intake, inform them of the importance of controlling water intake during the dialysis period and the harm of excessive water intake, give them graduated drinking cups and salt control spoons, and ask them to limit water and salt intake. The total daily water intake from food minus the previous day's urine volume should not exceed 500ml to enhance the self-management of water intake. In accordance with the requirements of COVID-19 prevention and control, timely and effective education should be conducted on COVID-19 related knowledge and infection prevention, home self-management and monitoring, patient psychological care and diet management, etc., and bad behaviors affecting dialysis treatment of patients should be corrected.

Intervention group: On the basis of bedside health education in control group

Create a "Hand in hand, common health" WeChat group. The group included 2 deputy director doctors of the hemodialysis center, 4 supervisor nurses with more than 5 years of hemodialysis work experience (all with good communication and coordination skills), 1 psychological counselor, all patients in the intervention group and the researcher himself. The head nurse is the group leader, responsible for staff organization and

management. Select the leader of peer education. Three patients with continuous weight control of nearly one month, good compliance with fluid intake, good grasp of hemodialysis related knowledge, junior high school education level or above, strong communication skills, and willing to undertake peer education were selected as group leaders, and the medical staff conducted knowledge training for them. The content of the training is the significance and method of diet, medication, exercise knowledge and peer education for hemodialysis patients. Only those who pass the training can serve as the group leader to ensure that they master the correctness of knowledge and supervise them at any time during the implementation process. Peer education procedures: Every Monday, Wednesday and Friday, the medical staff will publish the group leader's weight gain, and the three group leaders will take turns to publish their own self-management experience, daily diet and activities in various ways such as text, pictures and videos, and tell about their difficulties and feelings in the process of self-management. Patients in the group will communicate and share their experience with the group leader in the WeChat group. The researcher is responsible for recommending public accounts related to hemodialysis to patients and regularly pushing high-quality popular science articles, health guidelines, diet and exercise knowledge related to kidney disease in the relevant public accounts. Based on the situation of patients, relevant health education themes are formulated once a week and distributed in the group announcement. Make a weekly summary in the WeChat group every Saturday night, announce the self-management of patients in the group this week, praise the good self-management of this week and let them share their experience, give correct guidance and encouragement to those who are not well managed, and make targeted plans for the next step.

Ethical Considerations - Informed principle: Before the research, obtain the permission of the ethics committee of the hospital where the subject is located and relevant departments, and introduce the purpose and significance of the research to the patients clearly. Voluntary principle: All patients enrolled in this study voluntarily participated in this study and actively signed patient informed consent, and they can voluntarily withdraw from the study during the study process, and will not be affected or harmed by any non-participation or withdrawal. Confidentiality principle: Respect the rights of the subjects, keep all the information and privacy of the patients absolutely confidential, and all the information in the research process is only used for this study, and will be destroyed after use. Fairness principle: equal treatment of each research object. Beneficial principle: If the intervention method is effective, after the end of the study, all patients in the control group will be added to the WeChat group of peer education to realize the beneficial principle. Principle of no harm: Every step and every detail of this study is based on the principle of not causing any harm to patients. All laboratory examinations and physical examinations are required for the treatment of patients' diseases and will not cause any harm to patients.

Data Analysis - After data collection, the data were carefully sorted and uniformly coded, all of which were recorded into SPSS23.0 for statistical analysis. The authenticity and completeness of the data were checked again before input. The researcher and another participant in the study were jointly responsible for input, and one person was responsible for input and the other person checked to ensure the accuracy of the data. The test level was $\alpha=0.05$, and $P<0.05$ was statistically significant.

The specific methods are as follows: Frequency and percentage were used to describe the counting data in the study; The mean ± standard deviation ($\bar{x}\pm s$) was used to describe the measurement data conforming to normal distribution in the study, and the median and quartile distance [M(Q)] were used to describe the measurement data not conforming to normal distribution; Pearson correlation analysis was used to explore the correlation between self-management behavior, self-efficacy and fluid intake in MHD patients. Chi-square test and Fisher exact probability method were used to compare the general data of the two groups. Independent sample t test was used to compare and analyze the measurement data conforming to normal distribution and homogeneity of variance between the two groups; The calibration t test was used to analyze and compare the measurement data conforming to normal distribution but with uneven variance between the two groups. Non-parametric Mann-Whitney U rank sum test was used to analyze and compare the measurement data that did not conform to normal distribution and had uneven variance between the two groups. Paired T-test was used to compare the measurement data with the difference in the analysis group conforming to the normal distribution, and non-parametric Wilcomxon signed

rank sum test was used to compare the measurement data with the difference in the analysis group conforming to the normal distribution.

3. Results and discussion

3.1 Case completion, elimination and shedding, and explanation of reasons

A total of 140 MHD patients were included in this study, and a total of 6 cases were lost to follow-up during the study, including 1 case of kidney transplantation and 1 death in the intervention group and 2 cases of hospital transfer, 1 case of kidney transplantation and 1 death in the control group. The sample loss rate was 4.3%. There were 68 MHD patients in the intervention group and 66 in the control group, for a total of 134 patients.

3.2 Comparison of baseline data between the two groups

General information for comparison

SPSS23.0 software was used to sort and screen the general data of the two groups of patients. The measurement data were recorded with mean ± standard deviation (□x±s), and the counting data were recorded with N (%). Comparison between the two groups of patients was performed by independent sample T-test method, and comparison between the two groups was performed by Chi-square test method for statistical analysis, in which Fisher exact probability method could be directly used if necessary to calculate P-value, and the test level in statistical analysis was specified as α=0.05. When P<0.05,The difference between the two groups was statistically significant. After comparing the general data of the two groups of patients, it can be seen that there is no statistical significance between the two groups of patients (P>0.05), indicating that the basic data of the two groups of patients are balanced and comparable, and intervention studies can be conducted on the two groups of patients.

Table 1

Baseline levels of patients in the two groups before intervention

index		Two groups of patients (n=134)	Intervention group (n=68)	Control group (n=66)	χ^2/t	P
Age (years)		46.4814.47±	46.4814.67±	46.4714.39±	0.006	0.995
Residual urine volume (ml)		112.6790.74±	110.5189.28±	114.7892.74±	0.272	0.786
Dialysis duration (month)		35.1020.15±	36.3920.55±	33.8519.83±	0.728	0.468
sex	male	88 (65.67)	45 (68.18)	43 (63.24)	0.364	0.547
	female	46 (34.33)	21 (31.82)	25 (36.76)		
matrimony	singlehood	12 (8.95)	6 (9.09)	6 (8.82)	/	0.708
	Be married	114 (85.07)	54 (81.82)	60 (88.24)		
	divorce	4 (2.99)	3 (4.55)	1 (1.47)		
	Be bereaved of one's spouse	3 (2.24)	2 (3.03)	1 (1.47)		
	other	1 (0.75)	1 (1.52)	0 (0.00)		
Educational level	Primary and below	12 (8.96)	7 (10.61)	5 (7.35)	/	0.888
	Middle school	59 (44.03)	29 (43.94)	30 (44.12)		
	Senior high school	25 (18.65)	11 (16.67)	14 (20.59)		
	collegiate	37 (27.61)	18 (27.27)	19 (27.94)		
	Above university level	1 (0.75)	1 (1.52)	0 (0.00)		
Employment situation	Off duty	109 (81.34)	55 (83.33)	54 (79.41)	0.339	0.560
	employed	25 (18.66)	11 (16.67)	14 (20.59)		
occupation	Civil servant	18 (13.43)	10 (15.15)	8 (11.76)	2.382	0.881
	Teacher	17 (12.69)	7 (10.61)	10 (14.71)		
	Worker	21 (15.67)	11 (16.67)	10 (14.71)		
	Peasant	49 (36.57)	24 (36.36)	25 (36.76)		
	Go into business	17 (12.69)	9 (13.64)	8 (11.76)		
	Health worker	7 (5.22)	2 (3.03)	5 (7.35)		
	Pupil	5 (3.73)	3 (4.55)	2 (2.94)		
	unemployed	0 (0.00)	0 (0.00)	0 (0.00)		

Number of escorts	0	14 (10.45)	6 (9.09)	8 (11.76)	2.609	0.271
	1	102 (76.12)	54 (81.82)	48 (70.59)		
	2	18 (13.43)	6 (9.09)	12 (17.65)		
religion	There are	50 (37.31)	23 (34.85)	27 (39.71)	0.338	0.561
	There is no	84 (62.69)	43 (65.15)	41 (60.29)		
Monthly income (Yuan)	0-999.	7 (5.22)	2 (3.03)	5 (7.35)	3.281	0.657
	1000-1999.	15 (11.19)	6 (9.09)	9 (13.24)		
	2000-2999.	11 (8.21)	7 (10.61)	4 (5.88)		
	3000-4999.	61 (45.52)	29 (43.94)	32 (47.06)		
	5000-7999.	31 (23.13)	17 (25.76)	14 (20.59)		
	8000 -	9 (6.72)	5 (7.58)	4 (5.88)		
Payment of medical expenses	At public expense	53 (39.55)	24 (36.36)	29 (42.65)	1.588	0.452
	Medical insurance	66 (49.25)	36 (54.55)	30 (44.12)		
	self-financing	15 (11.19)	6 (9.09)	9 (13.24)		
Dry weight (kg)		56.53 + / - 9.13	56.89 + / - 9.09	56.16 + / - 9.18	0.358	0.723
protopathy	Chronic nephritis	30 (22.39)	17 (25.76)	13 (19.12)	3.549	0.616
	hypertension	37 (27.61)	19 (28.79)	18 (26.47)		
	diabetes	18 (13.43)	7 (10.61)	11 (16.18)		
	Kidney stone	11 (8.21)	4 (6.06)	7 (10.29)		
	Polycystic kidney	9 (6.72)	3 (4.55)	6 (8.82)		
	other	29 (21.64)	16 (24.24)	13 (19.12)		
Number of complications	Heart failure	11 (8.21)	6 (9.09)	5 (7.35)	0.999	0.995
	hypertension	47 (35.07)	23 (34.85)	24 (35.29)		
	Muscle spasm	24 (17.91)	11 (16.67)	13 (19.12)		
	Pulmonary edema	5 (3.73)	3 (4.55)	2 (2.94)		
	hypotension	7 (5.22)	3 (4.55)	4 (5.88)		
	insomnia	11 (8.21)	6 (9.09)	5 (7.35)		
	headache	18 (13.43)	8 (12.12)	10 (14.71)		
	other	11 (8.21)	6 (9.09)	5 (7.35)		

3.3 Comparison of self-management behavior scale scores of patients in the two groups before intervention

Data sorting and statistical analysis were conducted on the scores of the disease self-management behavior scale of the two groups of patients before intervention, and the results showed that there was no statistical significance in the scores of the disease self-management behavior scale between the two groups of patients (P>0.05), indicating that there was comparability between the two groups of patients. From the comparison of scores of patients' disease self-management behavior scale before intervention, it can be seen that the dimension of "partnership" has the highest score, and the dimension of "implementation self-care" has the lowest score, and the scores of all dimensions and items have certain room for improvement. See Table 2.

Table 2

Comparison of self-management behavior scores of patients in the two groups before intervention (xs) ±

Dimension name and entry content	pre-intervention			t	p
	Two groups of patients	Intervention group	Control group		
Problem solving	1.89 + / - 0.46	1.94 + / - 0.45	1.81 + / - 0.48	1.562	0.121
1 When the results of the blood test are not satisfactory, I will look for the cause of the problem	2.00 + / - 0.85	2.02 + / - 0.81	1.96 + / - 0.84	0.416	0.678
2. I will improve the cause of the unsatisfactory blood test	2.01 + / - 0.85	2.20 + / - 0.81	2.03 + / - 0.99	1.070	0.286
6. When I have questions about kidney disease, I will take the initiative to ask others (such as medical staff, family members, friends or other patients)	2.11 + / - 0.82	2.17 + / - 0.71	2.00 + / - 0.95	1.148	0.253
7 When I have uncomfortable symptoms, I will think about what causes these symptoms and how they occur	2.12 + / - 0.87	2.21 + / - 0.67	2.06 + / - 0.98	1.064	0.290
12 When I eat food containing more phosphorus, I will increase my mood to reduce phosphorus drugs	1.09 + / - 0.43	1.11 + / - 0.53	1.03 + / - 0.17	1.120	0.266

Executive self-care	1.78 + / - 0.38	1.81 + / - 0.30	1.74 + / - 0.43	1.091	0.277
3. Even when I eat outside, I will deliberately choose foods that conform to the dietary principles (such as low sodium, low potassium, low phosphorus).	2.12 + / - 0.99	2.30 + / - 0.84	2.07 + / - 1.16	1.312	0.192
4. I will deliberately choose vegetables and fruits with low potassium content	2.11 + / - 0.92	2.18 + / - 0.89	2.03 + / - 0.99	0.934	0.352
5. I can complete the care of arteriovenous impotence	1.69 + / - 0.89	1.67 + / - 0.79	1.71 + / - 0.93	0.262	0.793
8. I will follow the instructions of the medical staff, and then cook the green vegetables	1.32 + / - 0.55	1.29 + / - 0.52	1.37 + / - 0.62	0.806	0.422
9. I clean the piercing site before dialysis	1.68 + / - 0.75	1.70 + / - 0.76	1.65 + / - 0.66	0.404	0.687
10 I will control my fluid intake so that my weight gain will not exceed 1 kg per day	2.02 + / - 0.89	2.06 + / - 0.84	2.00 + / - 1.07	0.366	0.715
16 When I am thirsty and want to drink water, I will still try to control my water intake	1.42 + / - 0.72	1.50 + / - 0.73	1.38 + / - 0.62	1.005	0.317
partnership	2.02 + / - 0.41	2.06 + / - 0.39	2.04 + / - 0.50	0.356	0.723
11 I check with the nurse to see if the ultrafiltration, blood flow rate and temperature Settings on the dialysis machine are correct	2.25 + / - 0.89	2.38 + / - 0.80	2.21 + / - 0.99	1.113	0.268
14 Before dialysis, if necessary, I will discuss with the medical staff the blood flow rate and temperature Settings I expect on the dialysis machine	1.72 + / - 0.82	1.70 + / - 0.72	1.75 + / - 0.90	0.374	0.709
15 Before dialysis, I will decide the puncture site together with the medical staff	1.88 + / - 1.03	1.92 + / - 1.01	1.85 + / - 1.01	0.408	0.684
19 Before dialysis, I will voluntarily tell the doctor how much I want to disclose for the doctor's reference	2.31 + / - 0.81	2.26 + / - 0.85	2.34 + / - 0.80	0.566	0.572
Emotional processing	1.81 + / - 0.58	1.91 + / - 0.38	1.77 + / - 0.61	1.533	0.128
13 When I have questions about kidney disease, I actively seek information about kidney disease from books, videos, TV or the Internet	1.91 + / - 0.91	1.92 + / - 0.71	1.9 + / - 1.16	0.164	0.870
17. I feel comfortable talking to medical staff about my psychological troubles	1.14 + / - 0.49	1.20 + / - 0.40	1.16 + / - 0.66	0.372	0.711
18. I will use some activities to reduce the psychological distress caused by dialysis	2.14 + / - 0.95	2.24 + / - 0.75	2.04 + / - 1.26	1.111	0.269
20. I will seek help from others to reduce the emotional problems caused by dialysis	2.04 + / - 0.92	2.24 + / - 0.72	1.97 + / - 1.13	1.660	0.100

3.4 Influence of WeChat peer education on disease self-management behavior of hemodialysis patients

Comparison of self-management behavior scale scores in the intervention group before and after intervention. The scores of the disease self-management behavior scale before and after intervention in the intervention group were sorted out, and the paired sample T-test was used for intra-group comparison. The results showed that the scores of all items were improved after intervention, except for item 12, the differences of other items in the intervention group before and after intervention were statistically significant (P<0.05). See Table 3.

Table 3

Comparison of self-management scale scores of intervention groups before and after intervention (□x±s)

Dimension name and entry content	Intervention group		t	p
	pre-intervention	post-intervention		
Problem solving	1.94 + / - 0.45	2.97 + / - 0.35	10.941	< 0.001
1 When the results of the blood test are not satisfactory, I will look for the cause of the problem	2.02 + / - 0.81	3.06 + / - 0.78	7.184	< 0.001
2. I will improve the cause of the unsatisfactory blood test	2.20 + / - 0.81	3.14 + / - 0.70	6.805	< 0.001
6. When I have questions about kidney disease, I will take the initiative to ask others (such as medical staff, family members, friends or other patients)	2.17 + / - 0.71	3.24 + / - 0.72	9.903	< 0.001
7 When I have uncomfortable symptoms, I will think about what causes these symptoms and how they occur	2.21 + / - 0.67	3.14 + / - 0.68	7.775	< 0.001
12 When I eat food containing more phosphorus, I will increase my mood to reduce phosphorus drugs	1.11 + / - 0.53	1.23 + / - 0.49	1.473	0.145
Executive self-care	1.81 + / - 0.30	2.68 + / - 0.39	14.216	< 0.001
3. Even when I eat outside, I will deliberately choose foods that conform to the dietary principles (such as low sodium, low potassium, low phosphorus).	2.30 + / - 0.84	3.11 + / - 0.77	5.471	< 0.001
4. I will deliberately choose vegetables and fruits with low potassium content	2.18 + / - 0.89	3.24 + / - 0.68	7.683	< 0.001
5. I can complete the care of arteriovenous impotence	1.67 + / - 0.79	2.58 + / - 1.05	6.159	< 0.001
8. I will follow the instructions of the medical staff, and then cook the green vegetables	1.29 + / - 0.52	1.92 + / - 0.93	5.159	< 0.001
9. I clean the piercing site before dialysis	1.70 + / - 0.76	2.42 + / - 0.96	5.226	< 0.001

10 I will control my fluid intake so that my weight gain will not exceed 1 kg per day	2.06 + / - 0.84	3.09 + / - 0.87	6.619	< 0.001
16 When I am thirsty and want to drink water, I will still try to control my water intake	1.50 + / - 0.73	2.39 + / - 0.99	5.734	< 0.001
Partnership	2.06 + / - 0.39	2.92 + / - 0.53	11.278	< 0.001
11 I check with the nurse to see if the ultrafiltration, blood flow rate and temperature Settings on the dialysis machine are correct	2.38 + / - 0.80	3.27 + / - 0.67	8.100	< 0.001
14 Before dialysis, if necessary, I will discuss with the medical staff the blood flow rate and temperature Settings I expect on the dialysis machine	1.70 + / - 0.72	2.50 + / - 1.01	5.793	< 0.001
15 Before dialysis, I will decide the puncture site together with the medical staff	1.92 + / - 1.01	2.70 + / - 0.98	4.590	< 0.001
19 Before dialysis, I will voluntarily tell the doctor how much I want to disclose for the doctor's reference	2.26 + / - 0.85	3.20 + / - 0.86	6.805	< 0.001
Emotional processing	1.91 + / - 0.38	2.72 + / - 0.54	10.464	< 0.001
13 When I have questions about kidney disease, I actively seek information about kidney disease from books, videos, TV or the Internet	1.92 + / - 0.71	2.88 + 1.02	6.632	< 0.001
17. I feel comfortable talking to medical staff about my psychological troubles	1.20 + / - 0.40	1.70 + / - 0.86	4.282	< 0.001
18. I will use some activities to reduce the psychological distress caused by dialysis	2.24 + / - 0.75	3.12 + / - 0.71	6.645	< 0.001
20. I will seek help from others to reduce the emotional problems caused by dialysis	2.24 + / - 0.72	3.20 + / - 0.77	7.427	< 0.001

3.5 Comparison of self-management behavior scale scores between the two groups after intervention

After the intervention, the scores of the disease self-management behavior scale of the two groups of patients were sorted out, and the two-independent sample T-test method was used for statistical analysis. The results showed: After intervention, the scores of the four dimensions in the intervention group were higher than those in the control group, except for items 5, 8, 9, 12, 14 and 19, the scores of other items between the two groups had statistical significance (P<0.05). See Table 4.

Table 4

Comparison of self-management scale scores between the two groups after intervention (□x□s)

Dimension name and entry content	post-intervention		t	p
	Intervention group	Control group		
Problem solving	2.97 + / - 0.35	2.76 + / - 0.30	3.731	< 0.001
1 When the results of the blood test are not satisfactory, I will look for the cause of the problem	3.06 + / - 0.78	2.69 + / - 0.82	2.676	0.008
2. I will improve the cause of the unsatisfactory blood test	3.14 + / - 0.70	2.63 + / - 0.94	3.517	0.001
6. When I have questions about kidney disease, I will take the initiative to ask others (such as medical staff, family members, friends or other patients)	3.24 + / - 0.72	2.62 + / - 0.69	5.106	< 0.001
7 When I have uncomfortable symptoms, I will think about what causes these symptoms and how they occur	3.14 + / - 0.68	2.76 + / - 0.90	2.707	0.008
12 When I eat food containing more phosphorus, I will increase my mood to reduce phosphorus drugs	1.23 + / - 0.49	1.18 + / - 0.49	0.602	0.548
Executive self-care	2.68 + / - 0.39	2.32 + / - 0.36	5.530	< 0.001
3. Even when I eat outside, I will deliberately choose foods that conform to the dietary principles (such as low sodium, low potassium, low phosphorus).	3.11 + / - 0.77	2.53 + / - 0.89	4.015	< 0.001
4. I will deliberately choose vegetables and fruits with low potassium content	3.24 + / - 0.68	2.60 + / - 1.04	4.227	< 0.001
5. I can complete the care of arteriovenous impotence	2.58 + / - 1.05	2.54 + / - 0.84	0.192	0.848
8. I will follow the instructions of the medical staff, and then cook the green vegetables	1.92 + / - 0.93	1.69 + / - 0.93	1.444	0.151
9. I clean the piercing site before dialysis	2.42 + / - 0.96	2.46 + / - 0.90	0.196	0.845
10 I will control my fluid intake so that my weight gain will not exceed 1 kg per day	3.09 + / - 0.87	2.40 + / - 1.02	4.216	< 0.001
16 When I am thirsty and want to drink water, I will still try to control my water intake	2.39 + / - 0.99	2.03 + / - 0.90	2.231	0.027
Partnership	2.92 + / - 0.53	2.58 + / - 0.56	3.536	0.001
11 I check with the nurse to see if the ultrafiltration, blood flow rate and temperature Settings on the dialysis machine are correct	3.27 + / - 0.67	2.76 + / - 0.99	3.479	0.001
14 Before dialysis, if necessary, I will discuss with the medical staff the blood flow rate and temperature Settings I expect on the dialysis machine	2.50 + / - 1.01	2.21 + / - 0.96	1.731	0.086

15 Before dialysis, I will decide the puncture site together with the medical staff	2.70 + / - 0.98	2.15 + / - 1.12	3.021	0.003
19 Before dialysis, I will voluntarily tell the doctor how much I want to disclose for the doctor's reference	3.20 + / - 0.86	3.22 + / - 0.79	0.165	0.869
Emotional processing	2.72 + / - 0.54	1.69 + / - 0.50	11.400	< 0.001
13 When I have questions about kidney disease, I actively seek information about kidney disease from books, videos, TV or the Internet	2.88 + 1.02	1.85 + / - 1.05	5.733	< 0.001
17. I feel comfortable talking to medical staff about my psychological troubles	1.70 + / - 0.86	1.31 + / - 0.82	2.684	0.008
18. I will use some activities to reduce the psychological distress caused by dialysis	3.12 + / - 0.71	2.28 + / - 1.03	5.499	< 0.001
20. I will seek help from others to reduce the emotional problems caused by dialysis	3.20 + / - 0.77	1.65 + / - 1.05	9.783	< 0.001

3.6 Baseline data analysis of the two groups

General data analysis of the two groups of patients

There were no significant differences in gender, age, marital status, educational level, economic income, payment method of medical expenses, primary disease and dialysis complications between the intervention group and the control group (P>0.05), and the baseline of patients in the two groups was balanced. In terms of gender, there were more male patients than female patients, and the average age was about 60 years old. In terms of marriage, most patients have a complete family and can be cared for by their spouses and children, which is conducive to reducing patients' anxiety (Liang Jianli, 2020).In terms of educational level, most of them have received secondary education, but because this group of patients did not catch up with the popularization of higher education, there are not many people receiving higher education. In terms of employment, the majority of unemployed patients indicated that the normal life of hemodialysis patients had been seriously disturbed by the disease and it was difficult to continue to work, which was consistent with the findings of Zhao Yingdi et al. (2017).

In terms of care, most patients have special care. Due to China's cultural tradition, most of the patients have no religious belief, and rely more on family care and medical relations to support their spiritual world. In terms of the payment of medical expenses, most of them have medical insurance, and only 11.19% are self-funded. This is because the cost of hemodialysis is relatively high, and the medical insurance can bear most of the medical expenses of patients, and only a few patients with good economic conditions can insist on hemodialysis treatment at their own expense. In terms of income, patients who come for maintenance hemodialysis have a certain financial basis to afford the huge costs required for long-term hemodialysis. From the perspective of dialysis age, the average dialysis age of patients in this study is about 3 years, with the majority of patients aged 5 years, followed by patients aged 5 to 15 years, and a small number of patients over 5 years, which indicates that with the continuous progress of hemodialysis purification technology and the improvement of living standards, the treatment effect of patients is getting better and better (Wang Shourong & Yang Junhui, 2020).

The residual daily urine volume of most patients is less than 100ml and they are in anuria state. The average dry body weight was 56.53±9.13kg, which was relatively low compared with the dry body weight reported by Ahbap et al. (2015), which could be attributed to Chinese people's physical and dietary habits (Xiong Yuwan et al., 2022). In addition, many patients have cardiovascular complications such as hypertension, heart failure, pulmonary edema, and dialysis complications such as insomnia, headache, muscle spasm, and hypotension. Therefore, hemodialysis patients need to bear much more physical and psychological pressure than normal people (Chen Lijia & Wang Shaoqing, 2020).

3.7 Analysis of the scores of the disease self-management behavior scale of patients in the two groups before intervention

The comparison of scores of the disease self-management behavior scale between the two groups before intervention showed that there was no statistical significance in the scores of disease self-management behavior between the two groups (P>0.05), indicating that the baseline of self-management behavior ability between the two groups before intervention was balanced. As can be seen from the statistical results before the study, the average score of the dimension "partnership" established with medical staff was (2.02±0.41), which was the highest score. Among them, item 19 "I will take the initiative to tell the doctor how much I want to reveal for the doctor's reference" scored 2.31±0.81), which was the highest score. The dimension of "performing self-care" got the lowest score (1.78±0.38), and item 8 "I will cook vegetables after boiling them according to the guidance of medical staff" got the lowest score (1.92±0.93), which was basically consistent with Sun Donghan's (2015) study. These data indicate that due to long-term dialysis, patients have established a stable nurse-patient relationship with medical staff, but lack self-management behaviors, and are too dependent on and passively listen to medical staff. During dialysis, I can follow the health guidance of the medical staff and pay too much attention to how much water I need to ultrafiltration with the dialysis machine, but when I leave the hospital, I do not have enough understanding of how to control the intake of fluids and do not take action. Fluid intake is poorly controlled due to low levels of self-management behavior in patients and can result in IDWG values greater than 5% of dry body weight, reducing dialysis adequacy (Hafi et al, 2021). Self-management of MHD patients means that hemodialysis patients can reduce health problems caused by the disease through self-care activities, maintain a proactive attitude, take the initiative to learn disease-related knowledge and make correct behavior changes, and assume the responsibility of self-management of the disease to achieve their desired life goals (Cha, 2017). Many MHD patients know their weight gain but will not look for the cause, which requires effective measures to make patients change from negative to positive, change from passive to active, improve their disease management ability, from the heart always control the fluid intake during the dialysis period as an important and unlax thing in their life.

3.8 Analysis of the effect of WeChat peer education intervention

The self-management ability of patients is related to the recovery of the disease. The better the self-management ability of patients, the stronger the ability to control the symptoms caused by the disease, so as to reduce complications, reduce medical costs, improve the quality of life of patients, and prolong the life of patients. The self-management ability of patients has a great effect on their own health recovery. A large number of studies at home and abroad have shown that the self-management level of patients is positively correlated with their quality of life, that is, the higher the self-management level of patients, the better the quality of life. In this study, independent sample T-test was used to analyze the differences in self-management behavior scale scores between the intervention group and the control group after intervention, and the results showed that the self-management behavior ability of patients in the peer education group after intervention was significantly higher than that of the control group, and the differences in scores in four dimensions were statistically significant (P<0.05).

Among them, the score of "problem-solving ability" in the intervention group was 0.21 points higher than that in the control group, the score of "ability to perform self-care" was 0.36 points higher than that in the control group, the score of "ability to establish partnership with patients" was 0.34 points higher than that in the control group, and the score of "emotional processing ability" was 1.03 points higher than that in the control group. The higher the score, the greater the difference. It can be seen from the research results that the difference between the two aspects is the most significant in "emotional processing", and the difference in "problem solving" is the least, which is consistent with Song Yijun's research results, which may be related to patients' long-term physiological, psychological and economic pressure. It can be seen that the group discussion played a great role in the intervention process. With the help of WeChat platform, patients' psychological anxiety and emotional

depression were improved to some extent by enhancing the communication among patients, sharing their experiences at any time and providing mutual emotional support, especially for new patients with short dialysis time (3 months to 12 months).Taking patient communication as an important supplementary form of daily education can expand experience exchange and knowledge sharing among patients, relieve patients' psychological anxiety, enrich and increase patients' knowledge and ability of disease management, and enhance the effect of peer education, which is consistent with the research results of Wu Huijun (2020) and Chen Yamin (2019).

The comparison of self-management behavior scale scores before and after intervention in the intervention group showed that except for item 12, the other items had statistical differences before and after intervention ($P<0.05$).The results of the study showed that after intervention, the scores of MHD patients in four dimensions of self-management ability were improved, "problem solving ability" increased by 0.82 points, "performing self-care ability" increased by 0.87 points, "partnership ability" increased by 0.86 points, and "emotional processing ability" increased by 0.81 points. Among them, the "executive self-care" dimension has the most obvious effect, which indicates that through learning effective behaviors of others in the process of peer education, patients' self-management ability has been significantly improved. Therefore, the self-management behavior of MHD patients can be effectively improved through WeChat peer education, which is consistent with the research results of Cao Yonggui (2017).Through this study, it can be concluded that in the process of WeChat peer education intervention, MHD patients have a further understanding of their important role in self-management, and are more actively engaged in self-management knowledge and skills learning and various self-management behaviors, thus improving patients' self-management level.

It can be seen that WeChat peer education is a feasible form of health education. In addition, it can be seen from the comparison of the scores of the self-management behavior scale between the two groups after intervention that there was no statistically significant difference in items 5, 9, 12 and 19 ($P>0.05$), and there was no significant difference in the self-management ability between the two groups after intervention. It shows that there is little difference between the intervention effect of WeChat peer education on these aspects of patients' self-management behavior and bedside health education. More targeted peer education plans and projects will be developed in the future, hoping to strengthen peer education intervention for patients in this aspect and comprehensively improve patients' self-management ability. As can be seen from the comparison of self-management scale scores of the intervention group before and after intervention, there was no statistically significant difference in item 12 before and after intervention ($P>0.05$), indicating that the self-management ability of the intervention group was not significantly improved before and after intervention. In the process of WeChat peer education, patients communicated with each other anytime and anywhere, and peer educators shared good experience with each patient. To pass on the positive power to everyone, the level of disease-related knowledge of the educated has been continuously improved, and the enthusiasm has been greatly improved, but the change of lifestyle is a long-term process, which requires persistent and continuous efforts (Ren Qingli et al., 2017). This study only involved 6 months of intervention in patients, and the long-term effect of item 12 needs to be verified by further studies.

4. Conclusions and recommendations

The study proved that the implementation of WeChat peer education for maintenance hemodialysis patients can significantly improve the disease self-management ability of maintenance hemodialysis patients. With the help of WeChat platform, peer education can make communication between peers easier and more natural, knowledge acquisition more convenient and information transfer faster, and play a very effective role in enabling people to share information, ideas or behavioral skills together and learn correct knowledge, attitudes and behaviors among each other. The implementation of WeChat peer education provides patients and their caregivers with a timely and effective channel to obtain disease information, and provides a more convenient and efficient way to communicate with medical staff and fellow patients. Patients can learn good ideas and behaviors from peers at home through this platform, acquire rehabilitation knowledge and communicate with each other,

which improves patients' self-cognition level. It also increases motivation and initiative, coupled with family support and help, making it easier to establish good health behaviors. The implementation of WeChat peer education for maintenance hemodialysis patients is effective and feasible. In the future, this method is worthy of further research and application in clinical practice.

Due to the limitations of time, manpower and other objective conditions, the objects of this study were only included end-stage renal patients receiving MHD treatment in a tertiary A hospital in Wuhan City, and the sample selection had certain limitations and lack of representability. In future studies, the sample size of MHD patients will be expanded, multi-center clinical trials will be carried out, and the methods in this paper will be used in different hospitals and MHD patients to explore the applicability and feasibility of WeChat peer education. Due to the different intervention methods and many interfering factors between the two groups in this study, although strict quality control was carried out for the two groups before, during and after the intervention, the blinding method was still insufficient, single blind and double blind could not be implemented, and there may be contamination between the intervention group and the control group. In future studies, we will extend the study time of WeChat peer education, increase the number of follow-up visits, and make measurements at different times. We will use the statistics of repeated measurement data for further analysis, and further study the effect of WeChat peer education.

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