

# Use of a knowledge-attitude-behaviour education programme for Chinese adults undergoing maintenance haemodialysis: Randomized controlled trial

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## Abstract

**Objective:** To investigate the effects of a knowledge-attitude-behaviour health education model on acquisition of disease-related knowledge and self-management behaviour by patients undergoing maintenance haemodialysis.

**Methods:** Patients recently prescribed MHD were randomly assigned to a control group or an intervention group. Control group patients were treated with usual care and general education models. A specialist knowledge-attitude-behaviour health education model was applied to patients in the intervention group.

**Results:** Eighty-six patients were included ( $n = 43$  per group). Before intervention, there were no significant between-group differences in disease knowledge and self-management behaviour. After 6 months' intervention, a significant between-group difference in acquisition of disease knowledge was observed. Self-management behaviour scores (control of body mass, reasonable diet, correct drug intake, physical activity, correct fistula care, disease condition monitoring, psychological and social behaviours) for the intervention group were also higher than those for the control group.

**Conclusion:** These preliminary findings suggest that the knowledge-attitude-behaviour model appears to be a valuable tool for the health education of MHD patients.

## Keywords

Knowledge-attitude-behaviour model, health education, maintenance haemodialysis, self-management behaviour

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## Introduction

The knowledge-attitude-behaviour model modifies human health-related behaviours by dividing changes into three continuous processes: knowledge acquisition, belief generation and behaviour formation.<sup>1,2</sup>

Research has indicated that correlations between information level and overt behaviour (and between attitude and overt behaviour) are generally positive, albeit slight.<sup>1</sup> When the knowledge-attitude-behaviour model was applied to HIV screening of women in India (a country where over 1000 babies are infected with HIV each year), and to knowledge of dental treatment of patients with HIV, dramatic improvements in knowledge, attitude and reported behaviour were demonstrated.<sup>2,3</sup> Thus, knowledge acquisition, belief generation and behaviour formation are important aspects for improving patient health.

Maintenance haemodialysis (MHD) increases the survival rate of patients with end-stage renal disease (ESRD), and in China MHD is now widely prescribed for such patients.<sup>4</sup> Correspondingly, the number of MHD patients in China increased from 94 per million population in 2007 to 147.3 per million population in 2010.<sup>5</sup> However, few Chinese patients on MHD achieve their therapeutic target, particularly regarding blood pressure control, anaemia correction and mineral balance.<sup>6</sup> Furthermore, MHD patients may also experience psychological, physical or emotional stress as a result of disease-associated lifestyle changes. As a chronic condition, ESRD has an extended time period during which patients must learn to cope with life changes; this makes health education and self-management behaviours key factors in assessing the effectiveness of therapeutic interventions.<sup>7</sup> Thus, achieving adequate haemodialysis, – and providing subjective

and initiative activities for patients that enhance their self-management abilities – are key to reducing the occurrence of complications, and for maintaining a satisfactory health-related quality-of-life in those undergoing MHD.<sup>7</sup>

The present study hypothesized that application of the knowledge-attitude-behaviour model would positively affect health beliefs, facilitate changes in bad habits, enhance healthy behavior, and improve self-management behaviour and outcome in patients on MHD.<sup>7</sup>

To date, no studies have investigated the relationship between knowledge, attitude and behaviour changes for MHD patients. Therefore, the objectives of the present study were to explore the effects of a knowledge-attitude-behaviour health education model on the acquisition of disease-related knowledge, then to assess subsequent self-management behaviour in MHD patients.

## Methods

### *Patients*

Patients prescribed MHD between October 2011 and May 2012 at the Second Affiliated Hospital of Harbin Medical University were randomly selected for this study.<sup>1</sup> These patients fulfilled the criteria for chronic kidney disease classification standard stage 5 (renal failure) established by the United States Kidney Foundation Chronic Kidney Disease and Dialysis in Clinical Practice Guidelines Expert Group.<sup>8</sup> In addition, patients met the following study inclusion criteria: indicated for MHD;  $\geq 18$  years of age; MHD duration  $> 3$  months; MHD regularly scheduled (two or three times weekly); stable clinical condition; patient could read and understand the questionnaire supplied.

Stable MHD patients were defined as those with sufficient solute clearance by haemodialysis, a low water load (<3%), good control of blood glucose and blood pressure (<140/90 mm Hg), haemoglobin concentration  $\geq 100$ –120 g/l, no adverse cardiac events and no recent infections. Exclusion criteria included severe cognitive dysfunction, patients who could not take care of themselves after renal transplantation and patients with serious cardiovascular and cerebrovascular disease.

### **Randomization**

Patients were randomly divided into one of two main study groups, using computer-generated random numbers that were assigned according to enrollment order. Patients receiving odd numbers were assigned to the control group; patients receiving even numbers were assigned to the intervention group. A nurse (J.W.) with extensive clinical skills, professional knowledge and experience in mental health nursing was used to record patient data.

### **Control group**

Routine health education information covering diet, medication, exercise, monitoring, prevention and treatment of complications, as well as other measures, was given to each participant in this group. Blood pressure, body weight, urine output, ultrafiltration, fluid intake amount and any complications were recorded for each patient. Standard oral education and health education materials were used. Patient follow-up was by oral communication, scheduled once every 2 weeks.

### **Intervention group**

The knowledge-attitude-behaviour health education model was applied to the intervention group. Initially, a questionnaire<sup>9–11</sup> was completed by each patient.

Following completion of the questionnaire, patients received definitive information and education, including written materials, lectures and time to talk with the nursing staff (discussed below). This disease-related information included the purpose of haemodialysis, principles of haemodialysis, important aspects of haemodialysis, protection of internal fistulae, prevention of complications and emergency treatment.

According to the three stages of Kelman's change of attitude theory,<sup>12</sup> discussions were conducted every 2 weeks.

Patients in the intervention group were subdivided into five groups, each of approximately the same size, to enhance changes in their marginal beliefs and to achieve more focused and consistent health beliefs.

### **Data analyses**

The following analyses were undertaken only in the intervention group. Synchronized analysis and data sorting were conducted according to each patient's level of education, and health education understanding. The three nursing models of knowledge-attitude-behaviour were then used to conduct disease-related knowledge education, training of health beliefs and supportive health behaviour.<sup>13</sup>

Survey results were analysed by a specialist (L.L.) to understand the physical and mental aspects of each patient and the patient's family social status, so that areas for improvement and the support structure involved could be identified.

### **Communication with patients and their families**

Effective communication with patients in the intervention group and their family members included in-depth interviews (telephone and face-to-face interviews), to develop a trusting relationship. This relationship was intended to provide patients and their family

members with support for problems. Telephone hotlines (manned by healthcare professionals) were also opened, to encourage interactive education between patients.

### Active management of health behaviours

A stage-by-stage system (Figure 1) was used to train patients in the intervention group to actively manage their own disease and adopt correct health behaviours. Educational materials on dialysis were distributed to patients. In addition, lectures on MHD were held, and patients received individualized information and support if necessary.

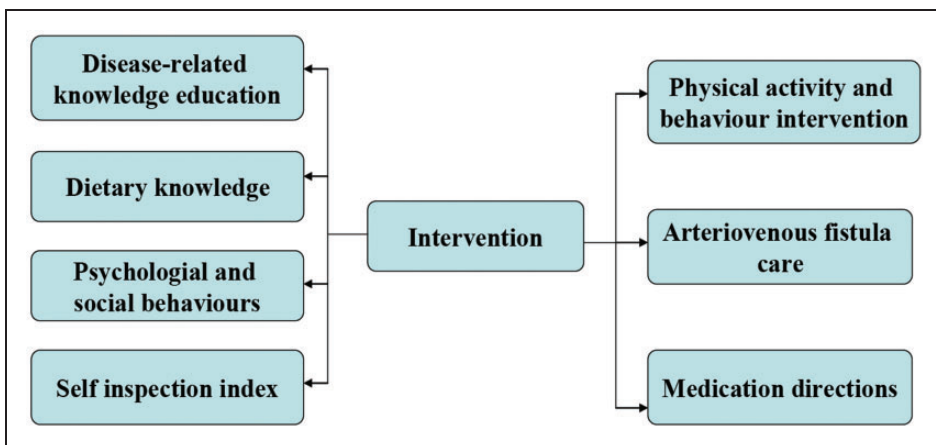
An advisory panel of experienced physicians and experts in haemodialysis was established to conduct self-management training and facilitate discussions among participants. The following topics were addressed, using health education methods suitable for the cultural and learning capacity of the patients involved.

**Disease-related knowledge education.** The objective and principle were presented and issues that need attention, such as protection of internal fistulae and prevention and emergency treatment of common complications were conveyed.

**Dietary knowledge.** This included discussion on the need to limit salt intake to <3 g of salt per day, to reduce thirst. Foods and flavourings that were high in salt were specified, including pickled products, chicken powder and monosodium glutamate. The need to restrict the volume of water and sodium ingested was covered, as was the need to control weight gain. Adhering to a strict diet and liquid intake regimen represents a key challenge for haemodialysis patients.<sup>14</sup>

**Psychological and social behaviours.** These behaviours were supported by patients being advised to talk frequently with counsellors, to eliminate or reduce negative moods. In addition, patients were encouraged to seek the psychological support that was available, in order for them to establish and sustain the confidence needed to manage their chronic disease.

**Self inspection index.** Patients and their families were encouraged to purchase haematomanometers and were then taught to obtain correct blood pressure measurements. Family members were also advised to maintain daily health diaries for the patient. These diaries included the following parameters: body weight; heart rate; blood



**Figure 1.** Flow diagram showing knowledge-attitude-behaviour interventions.

pressure; respiratory pattern; urinary volume; retention levels of sodium and water. Family members also learned to observe the patient for signs of oedema, with obvious short-term weight gain indicating excessive water load. In addition to measurements of body weight, oedema in the leg, foot, hand, upper limb and lumbosacral portion were to be noted.

**Physical activity and behaviour intervention.** These were encouraged. Moderate-intensity aerobic exercise was conducted regularly, using step-by-step and perseverance principles. Types of exercise advocated included Qigong, Taijiquan, jogging, cycling, swimming and/or walking three to five times each week, with each exercise period lasting 20–30 min.

**Arteriovenous fistula care.** It was important to ensure that this vascular access was used properly and maintained carefully to extend its use as long as possible. Patients and their families were shown proper fistula nursing methods, including preparing the arm before dialysis, not using the fistula side limb to lift heavy items, nor for drawing blood, blood pressure measurement, injections or infusions. Patients were taught to self detect the anastomotic murmur of the fistula and the associated 'trill' sound each day. Fistula smoothness was also recorded using touch or a stethoscope. If the vascular trill disappeared and a throb was not found at the anastomosis site, patients were advised that their internal fistula was blocked and were told to attend the hospital for diagnosis and treatment.

**Medication use.** Patients received close instruction in how to take their prescribed medications at the times indicated. Drugs associated with renal injury, such as gentamicin and certain Chinese traditional medicines, were prohibited. Drug effects and adverse reactions were monitored; routine blood tests and blood biochemistry were

assayed regularly using standard methods. Test results were monitored to assure an adequate level of dialysis.

Patient follow-up was conducted once every 2 weeks to assess intervention effects (using structured questionnaires).<sup>9–11</sup> Medical behaviours that were not in compliance with the directions of each patient's doctor were analysed and intervention schemes were adjusted accordingly.

### *Evaluation of intervention methods*

Intervention methods were evaluated in both study groups initially by assessing the patient's grasp of disease knowledge using a questionnaire<sup>9</sup> that included seven aspects and 20 items. This questionnaire was scored using a range between 0 and 3 points (0, absence of understanding; 1 partial understanding; 2 having a majority of correct answers; 3 complete understanding). Self-management behaviour was evaluated with parameters of chronic disease self management,<sup>10,11</sup> including diet management, psychological and social behaviours, oral drug compliance, disease condition monitoring, physical activity, arteriovenous fistula care and body quality control.<sup>15</sup> Twenty items that addressed these aspects were evaluated and analysed.

The results obtained had good reliability, Cronbach's  $\alpha$  coefficient was 0.89 and the retest reliability value was 0.83. Results were ranked using Likert class 4 scoring (1, never done; 2, occasionally done; 3, basically done; 4, completely done).

Since there were different numbers of items for each aspect of the self-management models, data were transformed into 10 fen models of scoring so that each aspect was comparable with others. An overall self-management behaviour score was obtained by averaging the scores of all the different aspects. The higher the score, the better the self-management behaviour exhibited by the patient.

Questionnaires were completed by participants in the intervention group prior to intervention and at 6 months postintervention.

### **Ethical considerations**

Approval for this study was obtained from the institutional review committee of Harbin Medical University, Harbin, China. Written informed consent was obtained from all patients according to the Declaration of Helsinki, prior to their assignment to a group.

### **Sample size**

Since no similar studies have investigated the relationship between knowledge-attitude-behaviour changes in MHD patients, the sample size was roughly estimated based on the following parameters prior to the trial:  $\alpha=0.05$ ,  $\beta=0.10$ ,  $\delta=1$  and  $\sigma=1.18$ . The value of  $n$  for the present study was 30. A 20% rate of incomplete or invalid data was also considered, based on previous experience. Therefore, a sample size of  $n > 36$  per group was considered appropriate to achieve the study objectives.

### **Statistical analyses**

Data were reported as mean  $\pm$  SD. Statistical significance between the means was determined and analysed using one-way analysis of variance (ANOVA),  $X^2$ -test, Student's  $t$ -test or paired  $t$ -test as appropriate, using SPSS® version 17.0 (SPSS Inc, Chicago, IL, USA). A  $P$ -value  $< 0.05$  was considered statistically significant, and a  $P$ -value  $< 0.01$  was considered highly significant.

### **Results**

In total, 91 patients were prescribed MHD between October 2011 and May 2012 at the Second Affiliated Hospital of Harbin

Medical University. Eighty six of these patients were eligible for participation in this study in this study ( $n=43$  per group). Figure 2 provides an overview of the study conduct.

### **Disease-related knowledge pre- and postintervention**

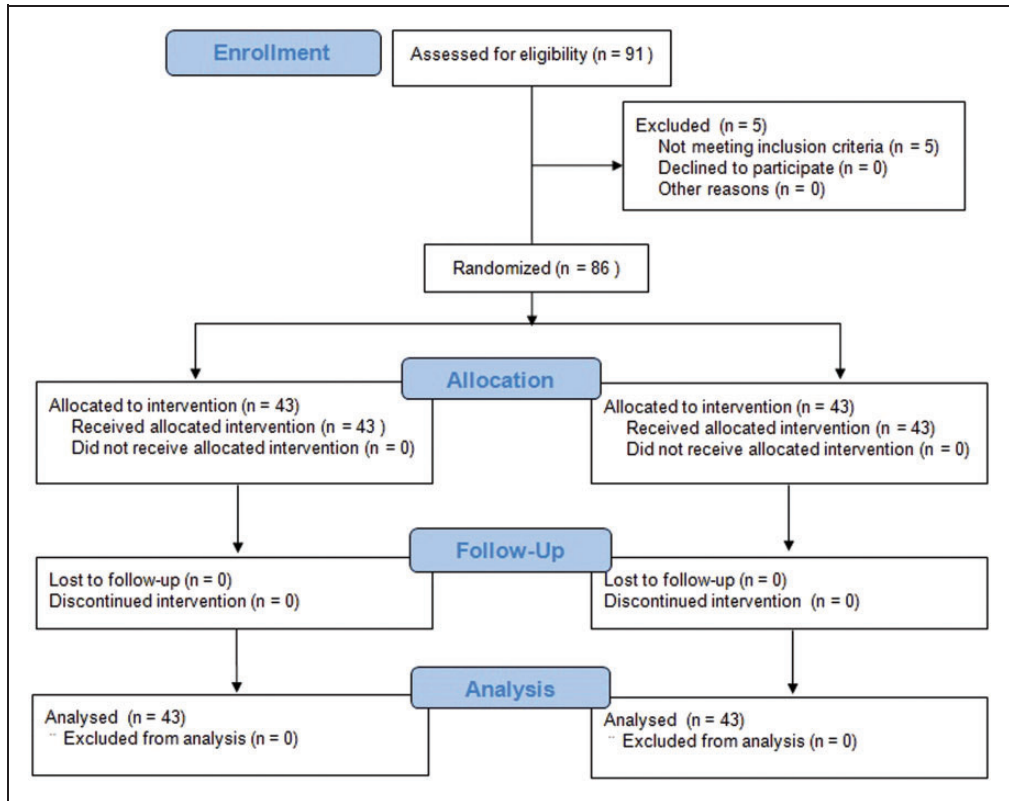
There were no statistical differences between patients' ages, sex, degree of education, body weight, duration of dialysis or cause of dialysis for those in the control group versus those in the intervention group (Table 1). In addition, there was no obvious difference in the extent of disease-related knowledge for each group prior to intervention. However, at 6 months postintervention, disease-related knowledge scores were significantly higher for patients in the intervention group, compared with their baseline levels, and also compared with scores observed in the control group ( $P < 0.05$  in each case; Table 2).

### **Self-management behaviours pre- and postintervention**

Self-management behaviour scores for the control and intervention groups did not show a significant difference prior to intervention ( $P > 0.05$ ). However, self-management behaviour scores for both groups were significantly higher after, compared with before, intervention ( $P < 0.05$ ). Furthermore, postintervention scoring for the intervention group was higher than that for the control group ( $P < 0.05$ ) (Table 3).

### **Discussion**

People requiring MHD face psychological and physical pressures that impact substantially on health-related quality of life (HRQoL). In addition, once patients begin MHD, they rely on such treatment for their survival.



**Figure 2.** Flow diagram showing randomization and outcomes of maintenance haemodialysis patients receiving either standard health education or knowledge-attitude-behaviour intervention.

The objective of the self-management model applied in this study was to provide MHD patients with the ability to cope with, and hopefully resolve, common problems associated with control of ESRD symptoms, compliance with a treatment programme and somatic discomfort. Health education is an important external factor that influences self-management behaviour,<sup>15</sup> although a further study<sup>16</sup> found that self-management education that simply provided information only produced a slight improvement in self-management behaviour in patients. The present study showed that, despite receiving health education, behaviours associated with poor self management continued to be observed in patients.

A strong motivation to maintain good health was key to patients realizing the benefits and necessity of treatment, thereby improving overall self-management.

The knowledge-attitude-behaviour model considers that knowledge is essential for effecting changes in behaviour, and that individuals can obtain knowledge and skills through learning. Accordingly, patients and their families need to actively receive knowledge, which can lead to a gradual development of healthy beliefs and attitudes that are reinforced with the adoption of healthy behaviours. Ren, *et al.*<sup>13</sup> and Zhao, *et al.*<sup>17</sup> demonstrated that application of the knowledge-attitude-behaviour model effectively established a healthy belief in patients and

**Table 1.** Baseline characteristics of maintenance haemodialysis patients randomized to receive either standard health education or knowledge-attitude-behaviour intervention.

Characteristic	Control group <i>n</i> = 43	Intervention group <i>n</i> = 43	Statistical significance
Male sex, <i>n</i> (%)	26 (60.5)	23 (53.5)	NS
Age, years	44.3 ± 14.6	41.7 ± 15.8	NS
Han ethnicity, <i>n</i>	43	43	NS
Weight, kg	70.6 ± 12.3	74.1 ± 13.5	NS
Duration of dialysis, months	6.5 ± 1.7	6.1 ± 1.9	NS
Albumin, g/l	28.1 ± 3.4	27.5 ± 2.3	NS
Phosphorus content, mmol/l	2.45 ± 0.19	2.38 ± 0.23	NS
Fluid gains between dialysis, l	2.56 ± 0.14	2.64 ± 0.38	NS
Cause of dialysis, <i>n</i>			NS
Chronic glomerulonephritis	16	17	
Diabetic nephropathy	12	10	
Chronic interstitial nephritis	8	9	
Sclerosis of renal arterioles in hypertension	4	5	
Polycystic kidneys	3	2	

NS, not statistically significant; data analysed by Student's *t*-test, paired *t*-tests or  $\chi^2$ -test.

led to the conversion of bad living habits to healthy behaviours. In the present study, knowledge was provided to the intervention group at health lectures and through the distribution of educational materials. The accessibility of this knowledge was intended to improve the recognition of health-related behaviours. Both the examiner and the patient analysed the patient's condition and self-evaluation in order to establish healthcare and rehabilitation objectives. Bad habits associated with self care were highlighted so that they could be eliminated; patients were encouraged to adopt a regular medication regimen that effectively controlled ESRD progression and promoted an improvement in self-management behaviour. Furthermore, the self-sufficiency of the patients we studied was found to be enhanced when patient cases were analysed and discussed, and when mutual help groups were established. Ideally, the goal for each patient should be to maximize their self-confidence, thereby encouraging them to participate in decisions regarding their health and self-management.

There was no significant difference in the extent of disease-related knowledge between the intervention group and the control group prior to intervention, indicating that patients in these groups were comparable. Patients could acquire disease-related knowledge from each intervention programme; however, a greater level of disease-related knowledge was obtained by the intervention group than the control group ( $P < 0.05$ ). These results suggest that patients can acquire effective self-management knowledge and skills following systematic guidance and training according to education levels. Moreover, a higher level of disease education can be gained by both patients and their families with effective application of a knowledge-attitude-behaviour initiative. Family members were encouraged to participate in study activities including attending informative lectures on haemodialysis, answering relative knowledge inquiries, studying dialysis educational materials and discussing effective communication with patients. In the present study, this led to a correction of lifestyle habits, enhanced



**Table 2.** Comparison of disease-related knowledge before and after either standard health education or knowledge-attitude-behaviour interventions in patients undergoing maintenance haemodialysis.

Subject (scores <sup>a</sup> )	Control group, n = 43			Intervention group, n = 43			Control vs. Intervention, 24 weeks Statistical significance <sup>c</sup>
	Baseline	24 weeks	Statistical Significance <sup>b</sup>	Baseline	24 weeks	Statistical significance <sup>b</sup>	
Disease condition monitoring	4.48 ± 1.09 (4.15, 4.80)	4.65 ± 1.04 (4.33, 4.96)	NS	4.74 ± 1.13 (4.40, 5.07)	7.07 ± 0.76 (6.84, 7.29)	P < 0.001	P < 0.001
Dry body weight	5.65 ± 1.92 (5.07, 6.22)	5.81 ± 1.86 (5.25, 6.36)	NS	5.04 ± 1.29 (4.65, 5.42)	7.35 ± 0.81 (7.10, 7.59)	P < 0.001	P < 0.001
Fistula care	5.00 ± 1.58 (4.52, 5.47)	5.21 ± 1.61 (4.72, 5.69)	NS	4.90 ± 1.23 (4.53, 5.26)	7.83 ± 0.84 (7.57, 8.08)	P < 0.001	P < 0.001
Diet principle	5.60 ± 1.54 (5.13, 6.06)	5.81 ± 1.43 (5.38, 6.23)	NS	5.12 ± 1.35 (4.71, 5.52)	7.60 ± 0.82 (7.35, 7.84)	P < 0.001	P < 0.001
Dialysis adequacy	5.53 ± 1.28 (5.14, 5.91)	5.67 ± 1.19 (5.31, 6.02)	NS	5.51 ± 1.14 (5.16, 5.85)	7.26 ± 0.82 (7.01, 7.50)	P < 0.001	P < 0.001
Drug treatment	4.07 ± 1.16 (3.72, 4.41)	4.21 ± 1.08 (3.88, 4.53)	NS	3.88 ± 1.33 (3.48, 4.27)	5.28 ± 0.59 (5.10, 5.45)	P < 0.001	P < 0.001
Knowledge of complication prevention	5.97 ± 1.53 (5.51, 6.42)	6.18 ± 1.38 (5.76, 6.59)	NS	5.88 ± 2.27 (5.20, 6.55)	7.18 ± 0.70 (6.97, 7.38)	P < 0.001	P < 0.001

Data presented as mean ± SD, (95% confidence intervals).

<sup>a</sup>Parameters were assessed using a questionnaire of disease knowledge. Scoring for each question ranged between 0 and 3 points (0, absence of understanding; 1, partial understanding; 2, majority of answers were correct; 3, complete understanding). Total scores were transformed into 10 fen models of scoring, which were compared with the other parameters.

<sup>b</sup>Versus baseline.

<sup>c</sup>Versus 6 months, Control group.

NS, not statistically significant; data analysed by Student's *t*-test.

self-monitoring, improvement in mood and good levels of patient participation in their individual self-management regimen.

Self-management intervention not only aims to provide patients with information, but more importantly, helps patients to master self-management skills. In this way, behaviour changes are enhanced, which is key to attaining and sustaining management objectives for patients.<sup>18</sup>

Patients on MHD experience the pressures of the disease and its treatment, but also may exhibit psychosocial traits, and have poor compliance with recommended diets, liquid intake restrictions and medication regimens.<sup>19</sup> Unfortunately, when self-

management behaviour compliance is compromised, there are severe consequences, including a decrease in HRQoL and an increased potential for MHD to become less effective. Patients who monitor their physical state using effective self-management methods and skills can eventually attain a satisfactory HRQoL.<sup>16</sup>

While receiving MHD, patients need to maintain adequate self-management behaviours.<sup>20</sup> Self-management behaviour was previously defined as the acquisition of MHD knowledge, such that health objectives are actively achieved and HRQoL improves.<sup>21</sup> Health knowledge is available from lectures, consultants, individualized

**Table 3.** Comparison of self-management behaviour scores between maintenance haemodialysis patients randomized to receive either standard health education or knowledge-attitude-behaviour intervention before and after intervention.

Subject (scores <sup>a</sup> )	Control group, n = 43		Statistical Significance <sup>b</sup>	Intervention group, n = 43		Statistical significance <sup>b</sup>	Control vs. Intervention, 24 weeks
	Baseline	24 weeks		Baseline	24 weeks		Statistical significance <sup>c</sup>
Control of body mass	4.77 ± 0.86 (4.85, 5.32)	5.09 ± 0.78 (4.85, 5.32)	P = 0.037	4.51 ± 1.18 (4.15, 4.86)	5.83 ± 0.78 (5.59, 6.06)	P < 0.001	P < 0.001
Reasonable diet	6.60 ± 1.04 (6.28, 6.91)	7.18 ± 0.85 (6.92, 7.43)	P = 0.003	6.86 ± 1.14 (6.51, 7.20)	8.46 ± 0.98 (8.16, 8.75)	P < 0.001	P < 0.001
Correct drug intake	4.76 ± 0.71 (4.54, 4.97)	4.88 ± 0.69 (4.67, 5.08)	NS	4.53 ± 1.07 (4.21, 4.84)	5.86 ± 0.94 (5.57, 6.14)	P < 0.001	P < 0.001
Physical activity	6.88 ± 1.17 (6.53, 7.22)	7.46 ± 1.12 (7.12, 7.79)	P = 0.011	7.04 ± 0.99 (6.74, 7.33)	8.90 ± 1.19 (8.54, 9.25)	P < 0.001	P < 0.001
Correct fistula care	9.53 ± 1.14 (9.18, 9.87)	10.27 ± 0.85 (10.01, 10.52)	P = 0.001	9.23 ± 1.04 (8.91, 9.54)	11.95 ± 1.32 (11.5, 12.34)	P < 0.001	P < 0.001
Disease condition monitoring	4.79 ± 0.94 (4.50, 5.07)	5.20 ± 0.80 (4.96, 5.43)	P = 0.016	4.62 ± 0.97 (4.33, 4.90)	6.04 ± 0.84 (5.78, 6.29)	P < 0.001	P < 0.001
Psychological and social behaviours	9.88 ± 1.23 (9.51, 10.24)	9.25 ± 1.19 (8.89, 9.60)	P = 0.009	9.16 ± 1.46 (8.72, 9.59)	11.67 ± 0.94 (11.38, 11.95)	P < 0.001	P < 0.001

Data presented as mean ± SD (95% confidence intervals).

<sup>a</sup>Parameters assessed using a questionnaire of self-management behaviour. Likert 4 class scoring was used (1, never done; 2, occasionally done; 3, basically done; 4, completely done). Total scores were transformed into 10 fen models of scoring that were compared with other parameters.

<sup>b</sup>Versus baseline.

<sup>c</sup>Versus 6 months, Control group.

NS, not statistically significant; Student's t-test or paired t-test.

instruction and participation in discussion groups. In comparison, traditional health education includes a process of disease recognition and requires subsequent changes in behaviour to improve clinical outcome.<sup>22</sup> Patients' perception of their health, self-management attitude and ways of coping with disease are important factors that affect patient compliance and self-management behaviour. Therefore, it is hypothesized that effective health education will increase compliance, thereby controlling disease recurrence and HRQoL.

Knowledge-attitude-behaviour theory is an extension of cognitive theory application in health education. Knowledge-attitude-behaviour theory proposes that

health knowledge and information are the foundation for establishing active and correct beliefs and attitudes towards disease; such attitudes are the driving forces for modifying patient behaviour.<sup>18</sup> Research has demonstrated that important correlations exist between the occurrence, development and prognosis of diseases.<sup>22</sup> Psychological, dietary, exercise and lifestyle interventions can positively or negatively contribute to disease recurrence. Improvements in health knowledge and the development of good health skills are important for enhancing patient health.<sup>23</sup> Self management needs to emphasize the patient's recognition of their own problems.<sup>24</sup> Ideally, both the health care

professional and the patient should recognize the health problems that exist and the issues of most concern to the patient. With this recognition, relevant issues can be addressed using self-management skills. Overall, the objective of the self-management model is not to cure diseases, but rather to ensure that the patient's state of health and function are satisfactorily maintained so that they can achieve an independent and healthy lifestyle. When self-management models have been applied to the prevention and control of chronic diseases, significant and positive effects on the patient's HRQoL, disease management and treatment compliance have been observed.<sup>25</sup> In combination, these measures resulted in improvements in patient survival.<sup>25</sup>

In the present study, self-management behaviour scores for the intervention group were significantly higher than those recorded prior to intervention and than those of the control group (Table 3). These data indicate that self-management knowledge was instilled into patients, and that behaviour guidance was achieved following an understanding of the dynamic changes that occur with application of the knowledge-attitude-behaviour model of nursing intervention. Moreover, this approach increased patients' health awareness, and led to corrections in unhealthy lifestyles and behaviours. These patients also followed their doctor's advice better, sustained a reasonable diet and strictly controlled both water and salt intake, compared with those in the control group. Such changes led to a decrease in the complications reported, an improvement in self-management behaviour, and a reduction in the obstacles to self-management encountered by the patient. Thus, disease control and alleviation of disease was achieved. Furthermore, these positive effects support the widespread application of the knowledge-attitude-behaviour model.

To conclude, application of the knowledge-attitude-behaviour model in health education has the potential to facilitate changes in bad habits, to enhance healthy behaviour and to improve self-management behaviour in patients undergoing MHD. Our preliminary findings need to be confirmed in larger studies.

### Declaration of conflicting interest

The authors declare that there are no conflicts of interest.

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### Note

1. Chinese Clinical Trial Register: OQQ-14005560.

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