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Enhancing adherence to diet therapy and fluid restrictions in hemodialysis patients: a study using the information-motivation-behavioral skills model

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Abstract

A common issue faced by many patients undergoing the Hemodialysis (HD) is non-compliance with diet therapy and fluid intake limitation. To address this issue, the educational model aims to change the required behavior of patients. The Information Motivation Behavior Skill (IMB) model is a behavioral intervention designed to promote behavior change in various situations. This study sought to assess how well the IMB educational model supports adherence to diet therapy and fluid restrictions in patients receiving HD. This study was carried out in the HD departments. It was a quasi-experimental study featuring a pretest and posttest design with a control group involving 80 patients. The participants were split into an intervention group that received education based on the Information Motivation Behavior Skill model (n = 40) and a control group that received standard hospital education according to standard operating procedures (n = 40). After eight dialysis sessions over a period not exceeding four weeks, participants were evaluated for adherence to diet therapy and fluid restrictions. Significant change in diet therapy and fluid restriction in the intervention group with the P-value of 0.001. In the control group, there is a significant change in diet therapy and fluid restriction with P-values of 0.005 and 0.002. There are no significant differences between the intervention and control groups in the pre-test for diet therapy and fluid restriction, with P-values of 0.221 and 0.146. However, in the post-test, there are significant differences between the intervention and control groups, with a P-value of 0.001. The Information Motivation Behavior Skill model of education shows great promise in promoting adherence to diet therapy and fluid restrictions.

Introduction

Hemodialysis (HD) is the most frequently used therapy for patients post-transplant, regardless of incidence or prevalence. Hemodialysis (HD) is the most prevalent type of kidney replacement therapy worldwide, comprising about 69% of all kidney replacement treatments and 89% of all dialysis procedure.[1] A 2018 cross-sectional survey of clinicians, policymakers, and patient representatives from 182 countries found that the median use of hemodialysis (HD) per country was 298.4 per million population (pmp). However, the rates varied dramatically, with a more than 7,000-fold difference between countries. For example, the Democratic Republic of Congo had a rate of 0.3 pmp, while Japan had a rate of 2,148 pmp, reflecting disparities in HD availability and access.[2] In Indonesia, HD is similarly widespread. In 2017, 77,892 patients were receiving HD, and 30,843 new patients started treatment that year.[3] In Central Sulawesi, the proportion of residents aged 15 years and older undergoing HD was 7.34%.[4]

Patients undergoing HD must adhere to diet therapy and fluid restrictions, which reflects their willingness to follow the prescribed dietary guidelines.[5] Many patients with HD have a history of nonadherence to these guidelines.[6] This non-compliance can lead to excessive accumulation of fluid in the body, which can potentially result in complications.[7] The mortality rate is high if complications occur in patients treated at home.[8] To overcome this problem, intensive efforts to increase adherence to diet therapy and fluid restrictions are needed.

Education can alter behavior to enhance health outcomes. A limited understanding of health information, such as about the flu vaccine, may lead to hesitation in getting vaccinated.[9] A pilot study demonstrated that an educational and supportive approach effectively improved health outcomes in stroke patients, particularly in increasing muscle strength and joint range of motion.[10] A literature review found that applying the transtheoretical model of learning effectively changed low-salt diet behaviors in patients with hypertension.[11] Additionally, the use of technology to educate patients and improve health literacy has grown in recent years.[12] Some of the above diseases are chronic diseases that require special attention by providing a more educational approach to change the patient's behavior which can improve their condition, such as hemodialysis patients who need education to change their behavior in terms of diet and fluid restriction.

Education can enhance adherence to diet therapy and fluid restrictions in patients undergoing HD. Research indicates that providing health education positively impacts adherence levels for these guidelines.[13] A holistic approach that incorporates both social support and education is crucial for helping patients with HD maintain adherence to diet and fluid restrictions.[14]

Education about diet and fluid restriction has been ongoing in the hospital. The education model used still uses the lecture method with leaflet media. However, patients are still not compliant with diet and fluid restriction, this can be seen from weight gain and symptoms of shortness of

breath that appear when patients undergo HD. This is because the model and media used for education do not support changing the behavior of HD patients. Therefore, there needs to be an education model that focuses more on changing behavior. One effective method to improve understanding and behavior is the Information–Motivation–Behavioral skills (IMB) model. This model emphasizes the need for relevant information, strong motivation or support, and the necessary behavioral skills to foster health behavior changes.[15] It suggests that achieving optimal health behavior change requires patients to have access to these elements to avoid risky behaviors.[16] However, the implementation of the IMB education model has never been applied to HD patients. Therefore, implementing the IMB model can enhance understanding and lead to behavioral changes in patients undergoing HD.

The IMB model comprises three main components. First, the information component provides patients with accurate and relevant details about their conditions, potential consequences, and treatment options. Second, motivation is crucial for driving behavior change, and within the IMB framework, researchers or health professionals use interviews to motivate patients. Third, behavioral skills focus on teaching practical and strategic skills that facilitate behavior change.[17] From the explanation above, it can be concluded that these three components are a single unit in the process of providing education which aims to change patient behavior and attitudes By integrating these components, the IMB model offers targeted education aimed at improving adherence to diet therapy and fluid restrictions in patients undergoing HD.[16]

Numerous studies have explored the application of the IMB model for addressing various health issues. For instance, a study[18] found that IMB-based interventions effectively increased involvement and quality of preventive behaviors among community-dwelling older adult. Similarly, a different study[19] demonstrated that IMB-based programs were useful and effective in promoting preventive behaviors in women with osteoporosis. Building on this, the present study aims to evaluate the effectiveness of the IMB model in improving adherence to diet therapy and fluid restrictions in patients undergoing HD.

Materials and Methods

Research design

This quasi-experimental study employed a pretest and posttest design with a control group (Figure 1).

Population and sample

The study population comprised patients undergoing HD at HD Departements in hospital X. A total of 84 patients were included and divided into two groups: intervention and control, each

with 42 participants. The sample was obtained when patients arrived for their scheduled dialysis sessions. Consecutive sampling was used for recruitment. Inclusion criteria were: undergoing routine HD, having been on HD for more than 3 months, age >18 years, and being in a stable condition during the education period. Exclusion criteria included cognitive disturbances or mental health issues, conditions requiring emergency treatment, HD more than twice a week, and high adherence rates. Two participants from each group were excluded due to requiring admission to the intensive care unit (Figure 2).

Data collection

Study instruments

The attitude scale for diet therapy of hemodialysis patients was used to measure adherence to diet therapy of patients undergoing HD.[20] This questionnaire has undergone validity and reliability tests, with Cronbach's alpha calculated in three subscales (n = 381), which confirmed the reliability of these subscales and the high internal validity.[21] The questionnaire was translated at the Hasanuddin University Makassar Language Center, back-translated, and subjected to validity and reliability tests. In the face validity test, the agreement value was 94.4 with a Content Validity Index (CVI) of 0.94; in the reliability test, Cronbach's alpha was 0.93.

The fluid control in hemodialysis patient scale was used to assess adherence to fluid restrictions in patients undergoing HD.[22] This questionnaire has undergone validity and reliability tests, with Cronbach's alpha coefficient of 0.88, and Cronbach's alpha for the subdimensions were 0.92, 0.80, and 0.67, respectively. The test and re-test correlation value was 0.94 ($P < 0.001$), indicating a significantly moderate correlation ($r = 0.58$, $P < 0.001$).[23] The questionnaire was translated at the Hasanuddin University Makassar Language Center, back-translated, and then subjected to validity and reliability tests. In the face validity test, the agreement value was 98.8, with a CVI of 0.98. In the reliability test, Cronbach's alpha was 0.94. Objectively, dietary compliance and fluid restriction can be seen from weight gain between dialysis sessions. In this study, weight was needed to ensure the results of the dietary compliance and fluid restriction questionnaires.

Study procedures

Intervention group

A total of four education sessions were conducted over 4 weeks. During the information stage, patients gathered after dialysis sessions received information about diet therapy and fluid restrictions for 15 minutes. In the motivation stage, motivational interviews provided personalized support to each patient, lasting no more than 15 minutes per session. The behavioral

skills stage involved teaching participants how to plan their diet and fluid intake at home, with their adherence monitored through logbook entries during HD sessions (Figure 2).

Control group

The education intervention followed the hospital's Standard Operating Procedures (SOP). The educational SOP implemented uses a mass education system, where education is provided simultaneously. This is different from IMB (Information-Motivation-Behavioral Skills) which provides education personally, consisting of three main components, namely information, motivation, and behavioral skills. Four sessions were conducted, one per week, with each session lasting 30 minutes. All participants were assembled after HD sessions for these educational meetings.

Data analysis

The Wilcoxon test, paired t-test, and Friedman test were used to assess changes in adherence to diet therapy and fluid restrictions over eight dialysis sessions.

To assess the differences between the two groups, the Mann–Whitney test, independent t-test, and Kruskal–Wallis test were employed to evaluate variations in diet therapy compliance and adherence to fluid restrictions.

Results

Data collection took place between December 2023 and January 2024. The intervention group received IMB model-based education across four sessions over 4 weeks, while the control group received education following the hospitals' standard operating procedures.

Characteristics of the respondents

Eighty respondents were divided equally into the intervention group (n = 40) and the control group (n = 40). The chi-square test revealed no significant differences in the characteristics of respondents between the two groups (Table 1).

Changes in adherence to diet therapy and fluid restrictions in the intervention and control groups

Significant improvements in adherence to diet therapy were observed in both the intervention group (P = 0.001) and the control group (P = 0.005). Similarly, significant changes in adherence to fluid restrictions were noted in the intervention group (P = 0.001) and the control group (P = 0.002).(Table 2).

Differences in adherence to diet therapy and fluid restrictions before and after the intervention in the intervention and control groups

There were no significant differences in pre-intervention diet therapy adherence between the intervention and control groups (P = 0.221), nor were there significant differences in adherence to fluid restrictions (P = 0.146). However, a significant difference in post-intervention diet therapy adherence was observed between the two groups (P = 0.001), as well as significant differences in adherence to fluid restrictions (P = 0.001) (Table 3).

Discussion

In this study, we evaluated the impact of IMB model-based interventions on patients undergoing HD in terms of their adherence to diet therapy and fluid restrictions. The findings indicate that these interventions considerably enhance the adherence of HD patients to both diet therapy and fluid restrictions.

This study employed various methods to help patients understand adherence to diet therapy and fluid restrictions. Motivational interviews were conducted to build patients' trust in nurses, boost motivation, and promote changes in behavior, attitudes, and cognition for self-management. Patients were also taught practical skills to develop and master, effectively altering their behavior toward diet and fluid restrictions. Overall, these findings demonstrate that IMB model-based educational interventions can effectively improve adherence to diet therapy and fluid restrictions in patients undergoing HD, providing personalized and patient-centered healthcare. Nurses can utilize this approach to manage patients with chronic diseases, including those undergoing HD.

This study utilized the theoretical IMB model, which, unlike other educational models, integrates behavior-changing interventions into three main components: information, motivation, and behavioral skills. Information pertains to the knowledge base about diseases, motivation seeks to alter attitudes and foster the desire for change, and behavioral skills involve training patients to learn and master skills that can effectively modify their behavior.[23]

The core part of the IMB model is information. This involves providing patients with accurate and relevant details about their disease, its consequences, and the available treatment options. Information can be conveyed through various methods, such as educational materials, health services, and digital platforms. As patients gain more knowledge and understanding, they can

make informed decisions and take appropriate actions to manage their health condition effectively.[17]

In this study, the three components of Information Motivation Behavior Skill were applied in this study which was conducted during 8 dialysis sessions and the provision of IMB model education was given to each patient during the dialysis session. Where each patient gets an education session from the three components. With details of the three components of the IMB Information Motivation Behavior Skill model, each 15 minutes. In the information, patients will be provided with a diet and fluid restriction guidebook. The patient's motivation will talk about their motivation during the dialysis session with the researcher and in the next session the researcher provides motivation to change their behavior of compliance with treatment including diet and fluid restrictions. The patient's Behavior Skill will be taught to compile a daily food menu which will be recorded on the monitoring sheet and will be evaluated at the next dialysis session, whether the menu that has been compiled is consumed while at home. The three components become one education session.

The findings obtained from the implementation of the IMB model education showed a significant increase in dietary compliance and fluid restriction, but in the control group there was no significant change in dietary compliance and fluid restriction. The challenge is how to provide behavioral skills in managing diet and fluids between dialysis sessions. The findings obtained that the motivational component is a more dominant component of the three components in changing behavior. Motivation plays an important role in encouraging behavioral change. In the IMB model, researchers or health professionals often conduct motivational interviews with patients. The purpose of this interview is to understand the patient's personal motivations and the social context that influences them, build trust, and increase their motivation and willingness to change behavior. Motivation can be strengthened by empowering patients, setting realistic goals, and highlighting the benefits of behavioral change.

Motivation plays a crucial role in initiating behavior change. Within the IMB model framework, researchers or health professionals often conduct motivational interviews with patients. These interviews aim to understand patients' personal motivations and social factors, build trust, and stimulate a desire to change behavior. Motivation can be enhanced by empowering patients, setting achievable goals, and emphasizing the benefits of behavioral change.[17]

Behavioral skills focus on teaching patients practical and strategic skills to facilitate behavior change. This involves educating patients on using useful tools, developing self-management techniques, overcoming challenges, and adopting healthier behaviors. Behavioral skills training

can include activities such as goal setting, problem-solving, self-monitoring, and practicing new behaviors. Ultimately, the interaction of all the model components—information, motivation, and behavioral skills—leads to a change in behavior.[17]

Applying the IMB model to patients undergoing HD can enhance positive behaviors by improving adherence to diet therapy and fluid restrictions, as the model is designed to facilitate behavior change. According to the IMB model, achieving behavior change for optimal health requires providing relevant information, offering strong support and motivation, and helping patients develop the necessary skills while avoiding risky behaviors.[16] By incorporating information, motivation, and behavioral skills, the IMB model effectively promotes understanding and behavior change.[24] Integrating these three components into a cohesive educational approach can lead to improved adherence to diet and fluid restrictions among HD patients.

Personalized management by nurses for patients with kidney diseases is crucial. A healthy and balanced diet includes the proper proportions of proteins, carbohydrates, fats, vitamins, and minerals. To ensure optimal health, a varied and balanced diet is essential. The kidneys play key roles related to eating patterns, including excreting body wastes, regulating fluid volume, and controlling blood pressure. After food intake, the body utilizes necessary substances and removes excess ones as waste through urine. If kidney function declines, waste can accumulate in the blood, leading to various complications.[25]

Fluid management is crucial for maintaining fluid and electrolyte balance in the body, involving the monitoring and measurement of fluid intake and output. In patients undergoing HD, increased fluid intake can be influenced by several factors, with thirst being a significant one. Thirst often occurs after consuming high-salt foods, as excessive salt levels can activate the thirst mechanism in the brain, prompting a desire to drink more fluids to maintain sodium balance.[26]

Dietary compliance and fluid restriction can be maintained by consistently implementing the IMB education model in providing education in the HD department, emphasizing the motivational component because it is in accordance with existing findings that motivation is the most dominant component in changing behavior.

The results of this study can serve as a reference for empowering nurses to implement educational programs based on the IMB model and develop comprehensive care plans for patients undergoing HD. This approach aims to enhance adherence to diet therapy and fluid restrictions. Additionally, addressing these aspects is crucial as other complications may exacerbate the condition of patients undergoing HD.

Conclusions

The IMB education model has been proven to improve dietary compliance and fluid restriction. This study provides valuable insights into the benefits of health education interventions for managing patients undergoing HD. By focusing on personalized interventions that address patients' information needs, motivation, and behavioral skills, this educational model enables nurses to develop comprehensive care plans tailored to each patient's needs. For further research, it is hoped that media can be added to support the education process, such as applications for monitoring diet and fluids between dialysis sessions.

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Table 1 Demographic characteristics of the participants of the intervention and control groups

Variable	Intervention group (n = 40)	Control group (n = 40)	p value*
	n (%)	n (%)	
Age			
Mean ± SD	51.7 ± 12.6	51.9 ±10.6	0.948[b]
Min–max	24–72	26–74	
Sex			
Male	21 (45.5)	25 (62.5)	0.366[a]
Female	19 (47.5)	15 (37.5)	
Educational attainment			
Elementary school	8 (20)	5 (12.5)	0.175[a]
Junior high School	6 (15)	5 (12.5)	
Senior high School	14 (35)	13 (32.5)	
Diploma	3 (7.5)	0 (0)	
Bachelor	7 (17.5)	16 (40)	
Magister	2 (5)	1 (2.5)	
Work			
Government	8 (20)	9 (22.5)	0.124[a]
employed	8 (20)	15 (37.5)	
Self-employed	24 (60)	16 (40)	
Unemployed			
Marriage status			
Married	31 (77.5)	31 (77.5)	0.161[a]
Single	1 (2.5)	2 (5.0)	
Divorced	4 (10)	7 (17.5)	
Duration of Hemodialysis			
<1 year	9 (22.5)	13 (32.5)	0.117[a]
1–5 years	17 (42.5)	20 (50)	
>5 years	14 (35)	7 (17.5)	
Comorbid diseases			
Hypertension	22 (55)	19 (47.5)	0.909[a]
Diabetes mellitus	12 (30)	13 (32.5)	
Kidney stones	3 (7.5)	4 (10)	
Gouty arthritis	3 (7.5)	4 (10)	

P<0.05; [a]Chi-square test; [b]Mann–Whitney test; SD-Standard Deviation

Table 2 Changes in adherence to diet therapy and fluid restrictions in the intervention and control groups

Variable	Intervention group						Control group					
	Pretest (n = 40)		Posttest (n = 40)		Mean difference (MD)	p value*	Pretest (n = 40)		Posttest (n = 40)		Mean difference (MD)	p value*
	Mean ± SD	Median (min–max)	Mean ± SD	Median (min–max)			Mean ± SD	Median (min–max)	Mean ± SD	Median (min–max)		
Adherence to diet therapy	41.40 ± 2.99	40.00 (37–48)	51.37 ± 3.54	52.00 (39–58)	9.97	0.01[a]	40.57 ± 2.92	40.00 (35–46)	41.70 ± 3.64	40.00 (36–50)	1.13	0.05[a]
Adherence to fluid restrictions	44.10 ± 4.70	44.0 (35–43)	53.45 ± 3.60	53.50 (46–60)	9.35	0.01[b]	39.55 ± 6.65	39.50 (26–54)	41.52 ± 4.95	40.00 (33–54)	1.97	0.02[b]

P<0.05; [a]Wilcoxon test; [b]Paired t-test; SD-Standard Deviation.

Table 3 Differences in pretes and posttest adherence to diet therapy and fluid restrictions in the intervention and control groups.

Variable	Intervention group (n = 40)		Control group (n = 40)			p value*
	Mean ± SD	Median (min–max)	Mean ± SD	Median (min–max)	Mean difference (MD)	
Pretest						
Adherence to diet therapy	41.40 ± 2.99	40.00(37–48)	40.57 ± 2.92	40.00(35–46)	−0.83	[a]0.221
Adherence to fluid restrictions	44.10 ± 4.70	44.0(35–43)	39.55 ± 6.65	39.50(26–54)	−4.55	[b]0.146
Post Test						
Adherence to diet therapy	51.37 ± 3.54	52.00(39–58)	41.70 ± 3.64	40.00(36–50)	9.67	[a]0.01
Adherence to fluid restrictions	53.45 ± 3.60	53.50(46–60)	41.52 ± 4.95	40.00(33–54)	12.23	[b]0.01

P<0.05; [a] Mann–Whitney test; [b] Independent t-test; SD-Standard Deviation

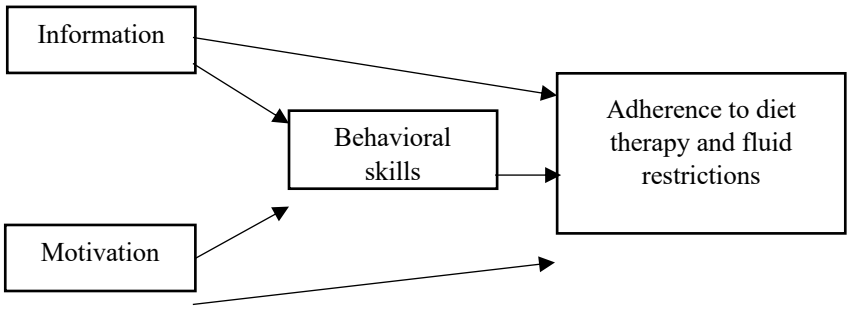

Figure 1 Theoretical framework of the study.Information–motivation–behavioral skills model of education for adherence to diet therapy and fluid restrictions

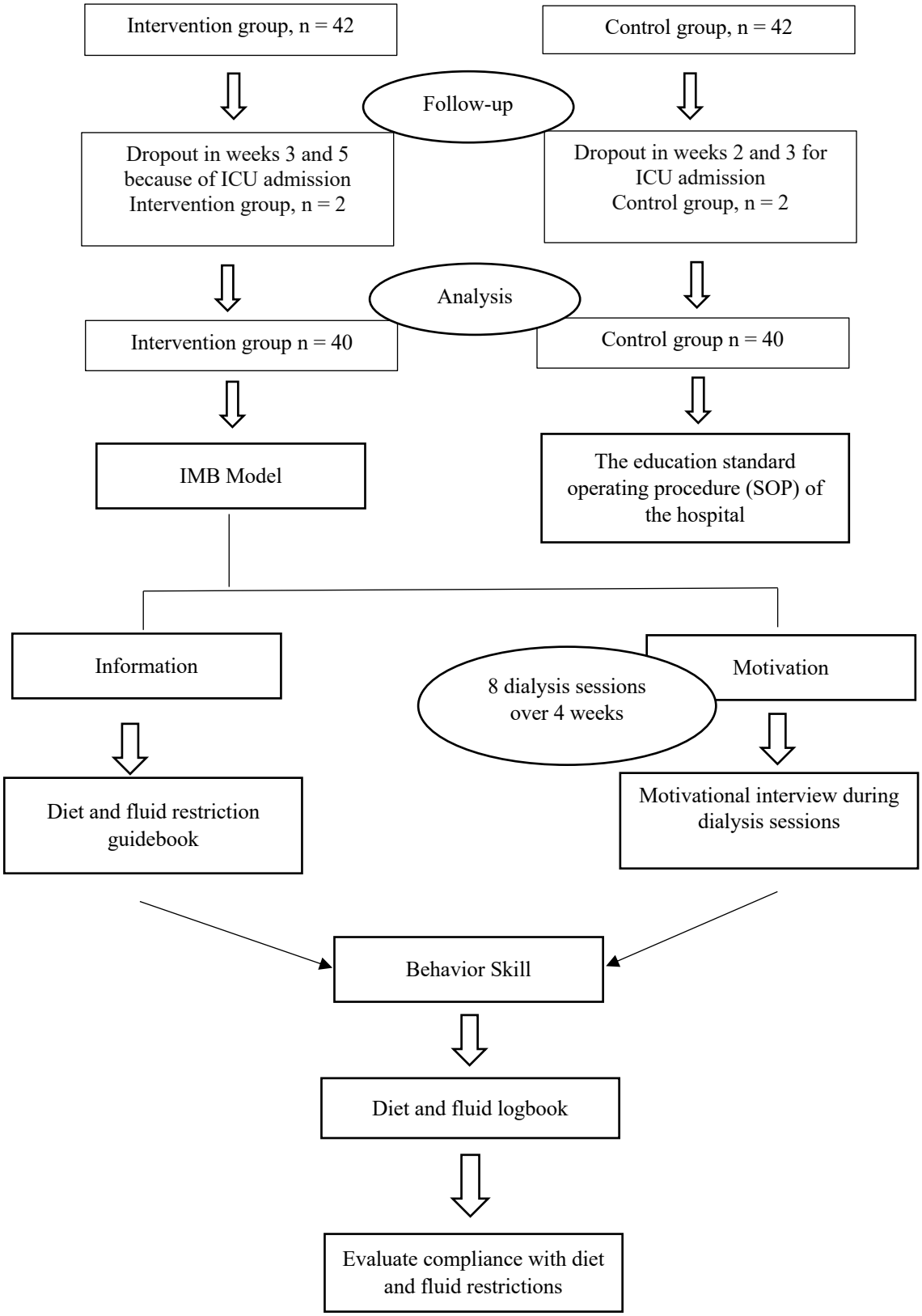

Figure 2 Flowchart of the study. Information–motivation–behavioral skills model of education for adherence to diet therapy and fluid restrictions.