Hemodialysis patients' self-care measurement scale an evaluation of reliability and validity

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Abstract

This study evaluated the reliability and validity of a scale to measure the degree to which hemodialysis patients practiced self care. We composed a conceptual framework for hemodialysis patients' self-care based on the Orem's nursing model (1991), and created a questionnaire to evaluate the practice of self-care in line with this conceptual framework. All 120 hemodialysis patients who participated in this study were undergoing treatment at two hospitals specializing in dialysis and provided informed consent to participate in this study. With regard to these results, in order to check for a response distribution bias and confirm that the questions encompassed the scope of the self-care conceptual framework, we examined the survey responses for content validity, differential validity, factorial validity, and the criterion-related validity, and at the same time confirmed the scale's reliability. The resulting universal self-care factor structure consists of 5 factors and 35 requisites, and the health-deviation self-care factor structure is comprised of 3 factors and 25 requisites. This analysis confirmed the high level of reliability and validity of this scale.

Introduction

In terms of the general way of thinking about self-care today, there is a common understanding that this refers to action that takes into consideration the advice of medical experts. However, it is up to the patient's own judgment to determine and implement necessary actions. [1-7] Naturally, a similar philosophy has been established with respect to dialysis patients' self-care, which includes safely receiving dialysis treatment, and easily maintaining and managing health.

Even if dialysis treatment progresses rapidly and treatment reaches an advanced level, a patients' Quality of Life (QOL) will be greatly affected by their quality of self-care. It is important to evaluate to what degree self-care, which impacts QOL, is being practiced. It is also important to determine what kinds self care are not practiced in order to improve nursing support for the patient.

DSCPI[8] and ESCA[9] are well known foreign research methods for evaluating self-care. The former is a scale that evaluates two domains, self-care capacity and self-care action, and the latter is a scale to evaluate self-care capacity alone. In addition, domestically, Honjo[10] is developing a questionnaire to assess the self-care capacity of late middle-aged patients who are chronically ill. Yet, within these, one cannot find the concepts needed to measure the degree of self-care practiced by dialysis patients, and neither of these were designed to evaluate the degree of self-care implementation.

Therefore, in this paper we describe the process undertaken to create a scale that evaluates the active practice of self-care and the reliability and validity estimates of this scale.

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Premises and Conceptual Framework of this Study

1. Premise of the Study

In this study we deal with questions based on Orem's self-care deficit model that evaluate the degree of universal self-care requisites and health-deviation requisites. We did not deal with questions regarding developmental self-care requisites, however, because individual differences are too great and evaluating the developmental stage is too complicated.

2. Conceptual Framework of the Study

Self-care generally refers to activities that an individual does in order to maintain, promote, and restore health, or prevent the worsening of illnesses and disabilities. This definition applies to dialysis patients as well. It is an activity aimed simultaneously at preventing the worsening of illnesses and complications, as well as maintaining a healthy life. Universal self-care in Orem's[12] self-care deficit model are those activities vital to maintaining life, and health deviation requisites are those needs which arise based on a patient's condition.

Research Methods

1. Study Participants

One hundred and twenty patients participated in this study. All were receiving treatment at two medical facilities specializing in dialysis. In addition, all understood the main aims of this study and granted consent. In terms of the survey procedure, we first received permission to conduct the study from the two hospitals. We then explained the survey and distributed a letter of request to potential participants to conduct a survey in which we promised to maintain patients' confidentiality. Then we asked consenting participants to fill out a questionnaire and collected responses after one week using the placement method.

2. Composition of the First Draft of Self-Care Questions

The questionnaire was based on Dorothea Orem's self-care model and included questions specific to the characteristics of dialysis treatment to measure the degree to which self-care is practiced. The survey consisted of 155 items including 121 items measuring universal self-care with the requisites areas of air, water, food, excretion, activity and rest, solitude and social interaction, hazard prevention, and promotion of normality. The survey also included 34 items measuring health-deviation self-care requisites from the perspective of the special characteristics of dialysis treatment such as shunt-region preservation, directions during treatment, and diet during treatment.

3. Evaluation of the Scale

We evaluated inter-rater reliability for the questions based on response distribution. The reliability of the scale measuring the degree of self-care was evaluated using Cronbach's α coefficient. To evaluate validity, we examined content validity, criterion-related validity, construct validity, and differential validity.

4. Process of Drafting Scale Questions

1) Question Selection: After extracting factors with an eigenvalue greater than 1.0 using the principal component method, we performed factor rotation using the Varimax method.

2) Question Composition: The questionnaire was composed of 121 universal self-care requisites and 34 health deviation self-care requisites, for a total of 155 items. All items used a four point Likert scale.

5. Other Measurement Scales Used

Measurement of self-care includes health-maintenance activities. Self-care includes health maintenance, restoration, and promotion activities seen at all stages of health. The Preventative Health

Behavior Scale[12] was used to establish criterion-related validity. Assessment was dependent on the correlation coefficient and partial correlation coefficient with the Preventative Health Behavior score. In this study, the Cronbach's α coefficient for the Preventative Health Behavior Scale was 0.800.

6. We used SPSS statistics software for data analysis during the scale creation process.

Results

1. Participants' attributes are shown in Table 1.

2. The Factor Structure for the Dialysis Patients' Self-Care Measurement Scale

1) Process Leading Up to the Determination of Questions

After scoring responses to the 155 self-care questions with 4 points assigned to those items that were very applicable, 3 points to those that were somewhat applicable, 2 points to those minimally applicable, and 1 point to those not applicable at all, there was no significant bias in the distribution of scores. We compared the standard deviation with each question's average for those questions exhibiting a correlation of 0.70 or higher, but no questions were deleted.

2) Factor Extraction

We completed principal component analysis for the 155 items surveyed (120 universal self-care requisites and 34 health deviation self-care requisites), and as a result of Varimax rotation of the number of factors forecast using the scree plot method, items with a factor loading of 0.4 or more were adopted. Ultimately, we extracted five universal self-care factors (Table 2) and three health deviation factors (Table 3). The eigenvalue, contribution ratio, and cumulative contribution ratio are shown in Table 2.3.

3) Self-Care Factor Structure

We extracted eight key factors after we combined and interpreted the various items. The following 5 universal self-care factors were identified: Factor one is the "dietary regulation factor," factor two is the "stress prevention factor," factor three is the "food safety factor," factor four is the "exercise regulation factor," and factor five is the "habit regulation factor." The following 3 health deviation self-care factors were identified: factor one is the "shunt preservation factor," factor two is the "therapeutic diet implementation factor," and factor three is the "observations of care instructions factor."

Table 1 Characteristics of the subjects

n=120

Background		n (%)
Age (years)	24-35	5 (4.2)
	36-45	17 (14.3)
	46-55	31 (26.0)
	56-65	30 (25.2)
	66-75	29 (23.6)
	76-83	8 (6.7)
Gender	Female	43 (36)
	Male	76 (64)
Diagnosis	DM	24 (20)
	HT	16 (13.3)
	others	80 (66.7)
Marital Status	Single	16 (13.3)
	Marriaged	104 (86.7)
Hemodialysis (years)	1under	14 (11.8)
	1-3	38 (31.9)
	3-5	21 (17.6)
	5-10	25 (21.1)
	10over	21 (17.6)
Education	6under	29 (24.2)
	7-11	65 (54.2)
	12-15	7 (5.8)
	16over	19 (15.8)
Health Condition	Good	84 (69.2)
	Poor	36 (30.8)
Alternative Medicine	No	95 (79.8)
	Yes	25 (20.2)

The member in the parenthesis indicates to percentage

3. Evaluation of the Reliability of the Scale to

Table 2 Factor loading of universal self-care for health Behavior Results of factor analysis, showing the factor selected items by means of Varimax rotation

n=120

Factor	No	Item	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅳ
Ⅰ	41	Do not eat late at night	0.745				
	42	Keep salt intake low	0.708				
	39	Stop eating when you are approximately 80% full	0.621				
	43	Keep sugar intake low	0.583				
	56	Always drink water after the bath	-0.57				
	102	Consume less-sweet foods	0.552				
	47	Eat home-prepared meals	0.533				
	52	Drink water daily	-0.53				
	57	Always drink water after exercise	-0.53				
	44	Keep fat intake low	0.509				
	40	Do not snack between meals	0.506				
	48	Avoid artificial ingredients(preservatives,chemical flavouring agents)	0.463				
Ⅱ	99	If made to feel unhappy, attempt to calm down as soon as possible		0.799			
	150	Use methods to avoid getting angry		0.719			
	100	Laugh away annoyances and insults		0.664			
	92	Avoid arguing and stressful confrontations		0.641			
	101	Remenber that each person is individual,and do not get too angry		0.534			
	133	If your health condition is pointed out by another person,take extra care		0.497			
	130	Express your opinions without offending other people		0.472			
	129	When feeling defeated,take a rest and try again		0.447			
	94	Avoid lying and insulting people,to keep the mind		0.407			
Ⅲ	115	Check calories and sodium content when buying food			0.781		
	114	Check the nutrition information panel when buying food			0.781		
	113	Check the use-by date of food when shopping			0.746		
	103	Check for lack of artificial ingredients in processed or kneaded foods			0.595		
	38	Take care to eat a balanced diet			0.459		
Ⅳ	131	Walk often				0.712	
	153	Do not use a car to go short distances				0.678	
	78	Use stairs rather than the elevator.Use stairs to climb one or two floors				0.647	
	79	Exercise daily(jogging,running,walking,radio calisthenics,or walking the dog)				0.599	
	81	Use the car,bus or train rather than walk,even for short distances				0.536	
Ⅴ	117	Reduce or stop drinking alcohol					0.773
	46	Keep alcohol intake low					0.744
	116	Reduse or stop amoking					0.685
	120	Practise safe sex					0.551
		Eigenvalue	4.661	3.459	3.136	2.505	2.479
		Proportion(%)	13.31	9.883	8.961	7.156	7.083
		Cumulative(%)	13.31	23.2	32.16	39.31	46.4

factor Ⅰis dietary regulation
factor Ⅱis stress prevention
factor Ⅲis food safety
factor Ⅳis exercise regulation
factor Ⅴis habit regulation

Table 3 Factor loading of health-deviation self-care for health Behavior Results of factor analysis, showing the factor selected items by means of Varimax rotation

n=120

Factor	No	Item	Ⅰ	Ⅱ	Ⅲ
Ⅰ	15	Keep the bllod shunt area clean	0.656		
	19	Watching out for reddening pain or swellings	0.651		
	16	Avoid carrying heavy weights with the arm used for blood shunting	0.618		
	18	Avoid resting your head on the arm used for blood shunting	0.599		
	17	Avoid measuring blood pressure with the arm used for blood shunting	0.581		
	14	Do not bear scratches on your skin	0.561		
	10	Gargle every day in order to prevent colds	0.551		
	11	Maintain distance when talking with people who have colds	0.515		
	12	Wear a mask when colds are prevalent	0.507		
	27	Avoid rubbing the area of the blood shunt or applying hot towels	0.469		
Ⅱ	3	Keep to a physician's recommended water intake		0.727	
	31	Keep salt intake to within the limits prescribed by the physician		0.725	
	2	Keep to a physician's recommended food intake		0.713	
	1	Consume fruit according to a physician's advice		0.703	
	30	Keep calories to within the limits prescribed by the physician		0.685	
	28	Keep to the prescribed diet for hemodialysis treatments		0.661	
	29	Keep sugars(sweet things,rice)to a minimum		0.459	
	4	Concume plenty of foods containing vitamins B and C		0.423	
Ⅲ	33	On specified days, measure the amount of urine produced			0.755
	32	On specified days, preserve all urine produced during that day			0.753
	23	Avoid doing heavy labour with the arm used for blood shunting			0.541
	13	Avoid eating foods you are allergic to			-0.49
	7	Always undergo hemodialysis on the set days			0.469
	34	Consume medicine at times specified by the physician			0.457
	22	Avoid immersing the biopsy wound in a bath until it is healed			0.441
		Eigenvalue	3.895	3.886	3.371
		Proportion(%)	15.58	15.54	9.912
		Cumulative(%)	15.58	31.13	35.56

factor Ⅰ is shunt preservation
factor Ⅱ is therapeutic diet implementation
factor Ⅲ is observations of care instructions

Measure the Degree of Dialysis Patients' Self-Care

1) Evaluation of Internal Consistency

As a result of G-P analysis, a significant difference of less than 1% was found between the upper and subscales and among the subscales.

2) Evaluation of Reliability using Cronbach's α Coefficient

Table 4 displays Cronbach's α coefficient for all questions by factor. The overall internal consistency index was 0.8. In addition, the internal consistency of the subscale was 0.5-0.8. These results support the reliability of this scale.

4. Evaluation of the Construct Validity

1) Correlation between the Self-Care Measurement Scale and the Preventative Health Behavior Scale Score

To confirm the validity of the Self-Care Measurement Scale, we compared it with the

Table 4 Reliability Analysis-Scale(Alpha)
Reliability Coefficients of each factors

Universal Self-care		
factor	Ⅰ	0.5955
factor	Ⅱ	0.7669
factor	Ⅲ	0.7695
factor	Ⅳ	0.6771
factor	Ⅴ	0.6906
total		0.7591
Health－deviation Self-care		
factor	Ⅰ	0.7661
factor	Ⅱ	0.8312
factor	Ⅲ	0.5401
total		0.8417
Preventive Health Behavior		0.6341

patient's Preventative Health Behavior Scale Score using the partial correlation coefficient. The result was 0.46 to 0.44 for the whole, and 0.47 to 0.74 between factors.

5. Evaluation of Content Validity

All content was evaluated in tandem with a nurse with 5 to 10 years of specialized experience in dialysis treatment. We selected questions carefully and obtained approval for all research.

Discussion

1. Dialysis Patients' Self-Care Factor Structure

Factor analysis indicated that the five universal self-care factors and three health deviation self-care factors appropriate to the questionnaire determined by the scree plot method had a structure similar to the first draft of the questionnaire based on the reference literature. Therefore, the five extracted factors are in line with the conceptual framework, and the structure encompasses the same content as the conceptual framework.

2. Reliability and Validity of the Dialysis Patients' Self-Care Measurement Scale

Cronbach's α coefficient was used to evaluate the reliability of the measurement of dialysis patients' self-care. It was 0.8 or higher for the scale overall and 0.5 or above for each subscale, indicating a high level of reliability and internal consistency. The cumulative contribution ratio of the universal self-care and health deviation self-care scales were 46.4% and 35.6% respectively. The product-moment correlation coefficient with the preventative health behavior in the criterion-related validity check can explain the construct validity.

Conclusion

With respect to the dialysis patients' self-care measurement scale, we drafted 155 questions and surveyed 120 dialysis patients, and performed factor analysis on these results. Through this analysis we identified 5 factors and 35 requisites for universal self-care, and 3 factors and 25 requisites for health deviation self-care. Calculation of Cronbach's α coefficient yielded a high value, both for each factor and all items overall (60 requisites). In addition, we found a significant positive correlation greater than 1.0% between each factor. These results indicate that the questionnaire is an internally consistent scale for each factor as well as overall. In addition, the significant correlation with the Preventative Health Behavior Scale supports the criterion-related validity of this scale.

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