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Factors Influencing Behavior of Taking Medicine in Elderly Patients Undergoing Hemodialysis

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ABSTRACT

Purpose: The elderly are often faced with multiple diseases, in particular hemodialysis (HD) which requires many kinds of medication. This study examined the factors influencing the behavior of taking medicine in elderly patients undergoing HD. **Subjects and Methods:** The subjects comprised 70 outpatients >65 years undergoing HD (48 male and 22 fe- male). The mean age of the patients was 72.5 ± 4.4 years. The mean duration of dialysis history was 6.1 ± 5.2 years. We performed a questionnaire survey using Medication Assessment Tool, The Kidney Disease Quality of Life (QOL) —Short Form and Acceptance for Dialysis Instrument. **Result:** Two factors related to poor behavior of taking medicine: dialysis history <2 years and poor acceptance of dialysis. The multiple regression analysis showed patient satisfaction ($\beta = -0.329$, $p < 0.01$) and symptoms/problems ($\beta = -0.273$, $p < 0.05$) as significant independent variables relating to behavior of taking medicine. **Conclusion:** Poor behavior of taking medicine is related to a short dialysis period, poor acceptance and poor satisfaction of dialysis therapy in elderly patients.

Keywords: Behavior of Taking Medicine; Hemodialysis; Adherence; Elderly Patient

1. Introduction

The number of patients undergoing hemodialysis (HD) for chronic kidney disease is increasing every year. The mortality rate of HD patients is also increasing. In Japan, the total number of dialysis patients was 297,126 and the number of patients newly inducted to HD was 37,532 in 2010. For the causative diseases, the first position of the new dialysis patient was diabetic nephropathy. In particularly, elderly patients newly inducted to HD are increasing (mean age: 67.8 ± 13.3); the ratio of the patients older than 65 years was 63.5% and older than 75 years was 34.9% [1].

The elderly are often faced with multiple diseases, such as diabetes mellitus, hypertension, heart disease, and cerebrovascular disease. The processes of excretion of waste material, adjustment of water and electrolyte balance, hormonal resolution and excretion and activation of vitamin D work poorly in HD patients, requiring elderly HD patients to take many kinds of medicine. Graveley *et al*. have reported that the incidences of side effects and interactions of medicines occur 2 - 3 times more often in elderly people than in young people [2].

Other studies [3-6] have reported that adherence to medicine is influenced by several factors: lifestyle, effect of treatment, side effects, anxiety about the disorder, confidence in treatment, simple explanation of the medicine, presence of social or family support, and relationship between nurses and patients. Moreover, poor adherence to medicine is frequent in elderly patients [7]. Nurses also have a role in ensuring patients carry out self-care adequately. Therefore, we thought that the behavior of taking medicine should be properly evaluated.

There are few studies on the behavior of taking medicine in elderly HD patients. The purpose of this study was to elucidate the factors influencing the behavior of taking medicine in elderly patients undergoing HD.

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2. Subjects and Methods

2.1. Subjects

Subjects were 70 patients >65 years undergoing HD. Inclusion criteria were more than three months since the induction of HD, no major change in treatment content within the past three months and diagnosis of psychosis or dementia.

We collected individual clinical records and carried out a questionnaire survey. The questionnaire survey was carried out either during dialysis or after dialysis. When it was difficult for the patient to complete the survey in-house, we had them complete it at home, and collected it by collection box within a week. When it was difficult for the patients to write by themselves, the survey was taken verbally. The clinical record includes causative disease, dialysis history, weight gain rate between dialyses, clinical data, presence of diabetes, treatment content and type of oral medication. Clinical data was the most recently obtained data before the dialysis.

2.2. Behaviors of Taking Medicine

Medication Assessment Tool (MAT) [8] was used to study the behavior of taking medicine by the patients. MAT was developed to evaluate whether an outpatient understands how to take oral medicine and it consists of 11 items (**Table 1**). As for the evaluation, each item was evaluated on a 4-point scale from 1 to 4 with a total score between 11 and 44. A high score indicates problems in acceptance of taking the medicine.

2.3. Measuring QOL

The Kidney Disease Quality of Life-Short Form instrument (KDQOL-SF^{TM}; version 1.3) was used for this study.

Table 1. The items of the MAT.

1	Is it easy to understand how to take medicine?
2	Are you worried about side effect of the medicine taking now?
3	Do you understand why medicine is necessary by oneself?
4	Is the explanation of the medicine helpful to understand medicine?
5	Do you feel an effect of the medicine?
6	Is the medicine helpful to prevent sick deterioration?
7	Do you think that it is not good to depend on medicine?
8	Is the expense of the medicine a burden?
9	Do you think that there may be less medicine than now?
10	Is the work to take the medicine troublesome?
11	Does the taking medicine go well generally?
	One item marks from 1 to 4 points.

It was developed to evaluate the quality of life of patients with chronic kidney disease; its reliability and validity have been confirmed [9]. It consists of the kidney disease-specific instrument of 43 items and the Short-Form Health Survey of 36 items (SF-36), which is a generic instrument. It takes around 15 - 20 min to answer, which is a burden for elderly people. Therefore, we changed the SF-36 to the Short-Form Health Survey of 8 items (SF-8^{TM}), which can measure the same health concept with a shortened questionnaire, reducing the burden on elderly patients [10]. The score of all variables is high when QOL is good. The content of KDQOL-SF^{TM} and SF-8^{TM} is shown in **Table 2**.

Twenty eight items of KDQOL-SF^{TM} consist of four variables: symptoms/problems (KD1), effect of kidney disease (KD2), burden of kidney disease (KD3) and sleep (KD6); and six items consist of two variables: cognitive function (KD4) and quality of social interaction (KD5). There are also two items of social support (KD7) in KDQOL-SF^{TM} that evaluate the relationship between patients and their family or friends, and three items, which consist of two variables, dialysis staff encouragement (KD8) and patient satisfaction (KD9), to evaluate the relationship between the patient with medical staff.

Six items of SF-8^{TM} consist of general health perceptions (SF8GH), physical functioning (SF8PF), role functioning physical (SF8RP), bodily pain (SF8BP), vitality (SF8VT), and social functioning (SF8SF) to evaluate the physical state of the patient. The other two items of SF-8^{TM} consist of mental health (SF8MH) and role functional emotional (SF8RE) to evaluate the psychological state of the patient.

Table 2 .Variables in SF-8^{TM} and KDQOL-SF^{TM}.

Variable
SF-8^{TM}
General Health Perceptions (SF8GH)
Physical Functioning (SF8PF)
Role Functioning Physical (SF8RP)
Bodily Pain (SF8BP)
Vitality (SF8VT)
Social Functioning (SF8SF)
Mental Health (SF8MH)
Role Functional Emotional (SF8RE)
Physical Component Summary (PCS-8)
Mental Component Summary (MCS-8)
KDQOL-SF^{TM}
Symptoms/Problems (KD1)
Effect of kidney disease (KD2)
Burden of kidney disease (KD3)
Cognitive function (KD4)
Quality of social interaction (KD5)
Sleep (KD6)
Social support (KD7)
Dialysis staff encouragement (KD8)
Patient satisfaction (KD9)

2.4. Evaluation of Acceptance of Dialysis

Acceptance of the dialysis instrument [11] consists of ten items and was developed to evaluate the psychological adjustment level of patients with chronic kidney disease, from dialysis induction to the maintenance period (**Table 3**). In the evaluation, each item was evaluated on a 4-point scale 1 to 4, with a total score between 10 and 40. A high score indicates that the receptive level is low.

2.5. Statistical Analysis

All data were expressed as means ± SD and the comparison between the mean of each item was carried out using t-test, analysis of variance, U-test of Mann-Whitney. The data were analyzed using SPSS Statistics 18.0 software (SPSS, Chicago, IL, USA). We considered $p < 0.05$ as statistical significant.

2.6. Ethical Consideration

This study was approved by the Committee of Medical Ethics of Hirosaki University Graduate School of Medicine, Hirosaki, Japan. The subjects gave us informed consent.

3. Results

3.1. Relationship between Patients' Characteristics and Total MAT Score

The α trust coefficient of Cronbach's of the total MAT score was 0.777.

We examined the relationship between patients' characteristics and MAT. The MAT score of the patients with a dialysis history of less than 2 years was significantly higher than those with more 2 years of history ($p < 0.05$). The MAT score showed no relation with other characteristics (**Table 4**).

3.2. Relationship between Patients' Characteristics and Each Item on MAT

We compared the mean value of each item on MAT with the patients' characteristics. For the question, "Is it easy

Table 3. The items of the acceptance for dialysis instrument.

1	Are you afraid that you think that you must undergo dialysis all the time in future
2	Are you anxious whether you can live by dialysis more how many years?
3	Are you anxious whether a physical complication does not occur?
4	Are you anxious in future whether you can continue work (housework)?
5	Are you anxious in future whether you can do life (economic aspects)?
6	Are you angry when you think why oneself must undergo dialysis?
7	Do you realize the situation to have to undergo dialysis?
8	Do you think that you had better die if you undergo dialysis, or you do not want to undergo dialysis?
9	How long do you receive explanation about the dialysis by the chief physician?
10	How long do you understand dialysis?
	One item marks from 1 to 4 points.

Table 4. The comparison between mean value of the total MAT score and the patients' characteristics.

Characteristic	Group	N (%)	Mean ± SD	p Value
Sex	Male	48 (68.6)	21.7 ± 4.4	ns
	Female	22 (31.4)	21.9 ± 5.3	
Age (years)	65 ~ 74	46 (65.7)	21.8 ± 4.2	ns
	≧75	24 (34.3)	21.5 ± 5.6	
Housemate	Lodger	61 (87.1)	21.6 ± 4.9	ns
	No	9 (12.9)	22.7 ± 3.0	
Education level	Elementary school or Junior high school graduation	37 (52.9)	22.0 ± 4.9	ns
	University or High school graduation	33 (47.1)	21.5 ± 4.5	
Causative disease	Glomerulonephritis chronic	12 (17.1)	22.2 ± 2.0	ns
	Diabetic nephropathy	37 (52.9)	21.7 ± 5.2	
	Nephrosclerosis	4 (5.7)	23.0 ± 5.7	
	A multiple cystic kidney	3 (4.3)	18.3 ± 7.0	
	Others	14 (20.0)	21.7 ± 4.4	
Dialysis history (years)	<2	17 (24.3)	24.0 ± 3.9	*
	≧2	53 (75.7)	21.1 ± 4.8	
Weight gain rate between the dialysis	A water well-controlled group	55 (78.6)	21.4 ± 4.9	ns
	A water poor-controlled group	15 (21.4)	23.0 ± 3.5	
Presence or absence of diabetes	Presence	37 (52.9)	21.7 ± 5.2	ns
	Absence	33 (47.1)	21.7 ± 4.1	
Diabetic treatment contents	An insulin injection	23 (62.2)	22.3 ± 5.4	ns
	An oral antidiabetic drug	4 (10.8)	17.2 ± 7.0	
	Only as for the diet	10 (27.0)	22.4 ± 3.4	

Continued

HbA1c (%)	<6	15(40.5)	20.8 ± 4.5	ns
	6.0 - 6.9	13(35.1)	22.4 ± 6.6	
	≧7	9(24.3)	22.4 ± 4.5	
The kind of the oral medicine(kinds)	<5	22(31.4)	20.6 ± 5.2	ns
	≧6	48(68.6)	22.3 ± 4.5	
Ht (%)	<30	15(21.4)	22.3 ± 5.2	ns
	30 - 32	22(31.4)	20.7 ± 5.8	
	≧33	33(47.1)	22.2 ± 3.6	

*p < 0.05, ns: not-significant. Data analysis: An U-test of Mann-Whitney (Age), A t-test(Sex, Housemate, Dialysis history, Weight gain rate between the dialysis, Diabetic presence, The kind of the oral medicine), An analysis of variance (Education level, Causative disease, Diabetic treatment contents, HbA1c, Ht).

to understand how to take the medicine?" the water well-controlled group showed a significantly lower score than the water poor-controlled group ($p < 0.01$). For "Are you worried about side effects of the medicine your taking now?" the group that had graduated university or high school (continued education) showed a significantly lower score than the group that had only graduated elementary school or junior high school (limited education) ($p < 0.05$). The group with a dialysis history of ≥2 years showed a significantly lower score than the <2 year group ($p < 0.05$). For "Do you understand why you must take medicine by yourself?" the continued education group showed a significantly lower score than the limited education group ($p < 0.001$). Moreover, for "Is the explanation of the medicine helpful to understand the medicine?" the continued education group showed a significantly lower score than the limited education group ($p < 0.05$). For "Is the medicine helpful to prevent the worsening of your illness?" the group with a housemate showed a significantly lower score than the group without a housemate ($p < 0.01$). For "Is the expense of the medicine a burden?" women showed a significantly lower score than men ($p < 0.05$). For "Does taking the medicine generally go well?" the group of the dialysis history of ≥2 years showed a significantly lower score than the <2 year group ($p < 0.05$). There was no significant difference between the scores regarding age, causative disease and the number of types of oral medication.

3.3. Relationship between QOL and MAT Score

Relationship between QOL and MAT score was examined. The mean value of the total MAT score showed significant negative correlations with SF8RE ($r = -0.24$, $p < 0.05$), MCS-8 ($r = -0.29$, $p < 0.05$) in the SF-8™, KD1 ($r = -0.38$, $p < 0.01$), KD2 ($r = -0.30$, $p < 0.01$), KD4 ($r = -0.32$, $p < 0.01$), KD5 ($r = -0.30$, $p < 0.05$), KD6 ($r = -0.31$, $p < 0.01$), KD7 ($r = -0.35$, $p < 0.01$), KD8 ($r = -0.33$, $p < 0.01$), and KD9 ($r = -0.38$, $p < 0.01$) on the KDQOL-SF™ (**Table 5**). The multiple regression analysis was used for the variables with a coefficient of correlation of more than 0.3 to determine variables significantly associated with MAT. Factors that influence MAT based on the multiple regression analysis are shown in **Table 6**. The mean value of the total MAT score showed significant negative correlations with KD9 ($\beta = -0.329$, $p < 0.01$) and KD1 ($\beta = -0.273$, $p < 0.05$) (**Figure 1**).

3.4. Relationship between MAT Score and Acceptance of Dialysis Instrument

The mean value of the total MAT score showed a significant positive correlation with the acceptance of the dialysis instrument ($r = 0.24$, $p < 0.05$) (**Figure 2**). This result means poor behavior of taking medicine relates to the poor acceptance of the dialysis therapy.

Table 5. Factors of QOL influencing the MAT by the correlation analysis.

Variable (item)	r	p
Role Functional emotional (SF8RE)[a]	−0.24	*
Mental component summary (MCS-8)	−0.29	*
Symptoms/problems (KD1)	−0.38	**
Effect of kidney disease (KD2)	−0.30	**
Cognitive function (KD4)	−0.32	**
Quality of social interaction (KD5)[a]	−0.30	*
Sleep (KD6)	−0.31	**
Social support (KD7)	−0.35	**
Dialysis staff encouragement (KD8)[a]	−0.33	**
Patient satisfaction (KD9)[a]	−0.38	**

*p < 0.05, **p < 0.01. [a]: Pearson's product moment correlation coefficient, Others: Spearman's rank correlation coefficient.

Table 6. Factors of QOL influencing the MAT by the multiple regression analysis.

Variable	Standard β	p value
Patient satisfaction (KD9)	−0.329	**
Symptoms/problems (KD1)	−0.273	*
Cognitive function (KD4)	−0.189	ns
Sleep (KD6)	0.014	ns
Social support (KD7)	−0.139	ns
Dialysis staff encouragement (KD8)	−0.222	ns

Adjusted $R^2 = 0.219$, *p < 0.05, **p < 0.01, ns: not-significant.

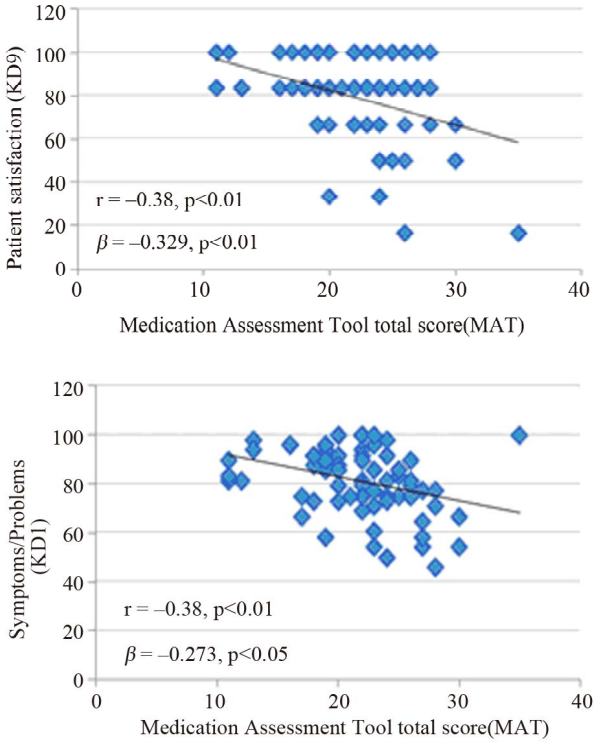

Figure 1. The mean value of the MAT score showed in particularly strong relation with Patient satisfaction (KD9) by multiple regression analysis ($\beta = -0.329$, $p < 0.01$). This result means poor behavior of taking medicine relates to the poor satisfaction of dialysis therapy. The mean value of the MAT score showed in particularly strong relation with Symptom/ Problem (KD1) by multiple regression analysis ($\beta = -0.273$, $p < 0.05$). This result means poor behavior of taking medicine relates to the poor healthy satisfaction of the symptom.

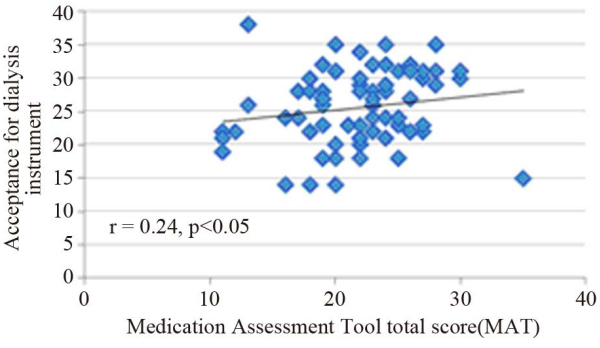

Figure 2. The mean value of the total MAT score showed a significant positive correlation with acceptance of the dialysis instrument ($r = 0.24$, $p < 0.05$). This result means poor behavior of taking medicine relates to the poor acceptance of dialysis therapy.

4. Discussion

The mean age of the patients in this study was 72.5 ± 4.4 years. The number of types of oral medication was 7.4 ± 3.1. Uejima *et al*. reported that patients older than 70 years take about five types of medication, which is twice that of patients younger than 40 years in Japan [12]. Elderly patients usually have multiple diseases and tend to take many medications; these rates increase for elderly HD patients. Moreover, elderly patients are more likely to forget to take their medicine, with noon being the most frequent time to forget [12].

We compared the mean value of the total MAT score relative to patients' characteristics. Patients with a dialysis history of more than 2 years, showed significantly better adherence to taking their medicine than those with less history. Siegal *et al*. have reported that an elapse of memory is more frequent in short-term HD patients than long-term HD patients [13]. Cukor *et al*. also noted memory lapse as a factor of worsened adherence of taking medicine in HD patients [14], as supported by our results.

We compared the score of each item in MAT relative to patients' characteristics. In regards to understanding how to take the medicine, water well-controlled patients had significantly better understanding than water poor-controlled patients. Lindberg *et al*. also reported that adherence of taking medicine is influenced by the avoidance of unnecessary fluid intake [15]. Water restrictions may therefore be a factor of poorer adherence to taking medicine.

Patients with less than 2 years of dialysis history also felt more apprehension of side effects of the medicine compared with those with more than 2 years of history, which was consistent with the total MAT score results. Patients with less than 2 years of dialysis history are thought to be unstable physically and psychologically, have poor disease acceptance, and apprehension for side effects of the medicine, which may worsen adherence. It is well known that side effects of medicine are associated with poor adherence [7,15-17].

Patients with a high school or university education had a better understanding of how to take their medicine than those with less education. This result suggests that patients are more likely to take their medicine after having understood the need of the medicine. We found no significant difference for the causative disease and MAT score, which is consistent with the results of Yuzawa [8].

The total MAT score showed significant negative correlations with SF8RE, MCS-8, KD1, KD2, KD4, KD5, KD6, KD7, KD8, and KD9. These results mean that if daily activity of HD patients for cognitive function and quality of social interaction are good, and the patients were satisfied with social support and the dialysis care, adherence is good in HD patients. Therefore, it is thought that the behavior of taking medicine is strongly associated with the QOL of HD patients.

In addition, the MAT score showed a particularly strong relationship with patient satisfaction and symptoms/problems by multiple regression analysis. Ferrans *et al*. have also reported that patient satisfaction of dialysis

care is significantly correlated with the mental state, QOL, renal function and symptoms of the patient [18]. Therefore, it is important to improve patients' satisfaction, psychological adaptation and QOL.

As we showed a strong connection between behavior of taking medicine and patients' satisfaction for the dialysis care provided by medical staff, more attention should be placed on the consultation situation of medical staff when patients have doubts in taking medicine and questions about their health, for further understanding of the patient's relationship with medical staff.

Moreover, the total MAT score showed a significant positive correlation with acceptance of the dialysis instrument. Thus, more acceptable dialysis treatment may lead to improved adherence. Much effort is still needed to help patients accept dialysis therapy.

5. Conclusion

Poor behavior of taking medicine is related to a short dialysis period and the degree of patient satisfaction for dialysis therapy. It is important to improve patient satisfaction for dialysis care, increase healthy satisfaction regarding symptoms, and allow patients to better accept their disease.

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