



Satisfaction with Life among Dialyzed Patients: A Cantril Ladder Survey

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ABSTRACT

Introduction: End-stage renal disease (ESRD) patients consider hemodialysis (HD) to be an invasive and time-consuming procedure. The total success of HD depends not only on the medical parameters, but also on the patients' satisfaction with life (SwL). The purpose of this study was to evaluate ESRD patients' self-reported SwL and compare it with patient-related and dialysis-related factors.

Materials and methods: Fifty-nine patients [average age = 63.3 (standard deviation, SD = 12.3), 19 women (32.2%)] were evaluated in the survey. Both the present and expected 5-year SwL scores were evaluated according to the Cantril ladder (CL).

Findings: The relations between the present and expected 5-year CL-SwL scores and gender, education, fulfillment of medical recommendations, months on dialysis, type of vascular access, urea reduction ratio (URR), and ultrafiltration (UF) were excluded. The results indicated highly positive relationships between high expected 5-year CL-SwL scores and being in a relationship, having a kidney graft performed in the past, and willingness to have a kidney graft performed in the future. The group of ESRD patients who were not in a relationship, did not undergo kidney grafts in the past, did not want to undergo a kidney graft in the future, and the eldest patients expected their SwL in 5 years to be significantly lower.

Practical implications: Cantril ladder is a useful tool for SwL measurements among ESRD patients. The ESRD patients who expected their SwL in 5 years to be significantly lower (who were not in a relationship, did not undergo a kidney graft, did not desire a kidney graft, and the eldest patients) must be provided with psychological support.

Originality: This article fills the gap in the ESRD patients' quality of life assessment. The self-reported present SwL was evaluated along with expected 5-year SwL.

Keywords: Cantril ladder, End-stage renal disease, Hemodialysis, Quality of life, Satisfaction with life, Vascular access.

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INTRODUCTION

During the past decades, both the prevalence and the costs of ESRD have increased.¹ The number and age group of patients who undergo HD have been increasing.^{2,3} Hemodialysis prolongs lives⁴ and improves the health of ESRD patients.² But it also may lead to emotional disturbances and changes in social life and roles. Hemodialysis may cause social isolation, decreases in both physical and mental health,² fatigue, depression,⁵ and cognitive impairment.^{6,7} The ESRD patients on chronic HD are less active than healthy controls.² Even the early stages of ESRD reduce the quality of life due to rather obvious risk factors of ESRD patients (i.e., senility, unemployment, and lower socioeconomic status).^{8,9} Additionally, multiple comorbidities, such as diabetes, hypertension,⁶ anemia,^{7,10} cerebrovascular diseases, hyperparathyroidism, and depression,⁷ have been detected among ESRD individuals. Patients consider HD to be an invasive and time-consuming procedure.⁶ Patients are exposed to large osmotic, fluid, and uremic toxin fluctuations.⁶ Consequently, all of the above-mentioned factors lead to poorer quality of life compared not only with the general population but also with patients with other chronic diseases.^{8,11} Aside from effective HD, a high SwL is an important factor of general satisfaction with renal replacement treatment.^{11,12} Therefore, the total success of HD depends not only on the medical parameters of the dialysis but also on the patients' frame of mind, satisfaction with treatment, and their overall health. Improving patients' SwL and well-being leads to improving the overall effect of HD.² For this reason, the subjective measures of SwL have received increasing attention.¹³

The purpose of this study was to provide information about ESRD patients' self-reported SwL scores and compare the results with the patient-related and dialysis-related factors. A better understanding of these relationships might lead to improvements of the SwL scores of ESRD patients¹⁴ and the overall effects of HD.

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MATERIALS AND METHODS

Data were collected in a single, outpatient, hospital-based HD center. A total of 135 patients, 18 years or older, were hemodialyzed at the time of data collection in May 2016. Each patient was asked to participate in a survey and received a questionnaire that included a survey, demographic and clinical questions and a CL measure. The entire questionnaire required approximately 30 minutes.

Following HD, many patients felt tired and in need of rest or sleep. These could have been caused by kidney failure itself or the HD treatment. The recovery time after HD increased with the durations of both ESRD and HD.¹² The cognitive functions of the ESRD patients reached higher levels approximately 24 hours after HD.⁷ Accounting for the information mentioned earlier, the patients were asked to complete the questionnaires one

day after HD when the ESRD patients' cognitive functions were potentially the best.

Of the 135 patients who received the questionnaires, 59 patients (43.7%) expressed their desire to participate and were evaluated in the survey (Table 1). The study was performed on a group of 19 women (32.2%) and 40 men (67.8%) who ranged in age from 28 to 84 with an average age of 63.3 (SD = 12.3). The patients answered questions regarding their demographic details (age, gender, and marital status), medical history (months on dialysis, vascular access, kidney graft, and fulfillment of medical recommendations). The presented data were compared with clinical information evaluating the quality of HD treatment including the dialyzer clearance of urea/dialysis time (Kt/V), URR, UF, and duration of a single HD (Table 1).

The SwL was evaluated by the CL, which is a subjective, nondisease-specific, self-reported measure.^{13,15} The

Table 1: Demographic, clinical, and dialysis-related factors affecting the CL ratings of SwL

	Participants		CL score					
			Present			Expected in 5 years		
			Mean (SD)	Sample mean vs population mean t-test	Sample mean vs sample mean t-test	Mean (SD)	Sample mean vs population mean t-test	Sample mean vs sample mean t-test
	n (%)	M [range] (SD)	Mean (SD)	p-value	p-value	Mean (SD)	p-value	p-value
	59 (100)		6.1 (2.1)			4.8 (2.7)		
Gender and age (years)	59	63.3 y [28–84 y] (12.3)	6.1			4.8		
Male	40 (67.8)	63.5 y [28–84 y] (12.7)	6.1 (2.1)	NS		4.6 (2.7)	NS	
Female	19 (32.2)	63.1 y [37–80 y] (11.4)	6.2 (2.0)	NS	N/S (vs male)	5.0 (2.6)	NS	N/S (vs male)
<50	8 (13.6)	39.8 y (7.5)	6.0 (2.0)	NS		5.0 (3.0)	NS	
50–60	13 (22.0)	57.6 y (2.0)	6.7 (1.6)	NS		5.8 (2.5)	NS	
61–70	23 (39.0)	65.2 y (2.6)	6.7 (1.7)	NS		5.4 (2.1)	NS	
71–80	12 (20.3)	76.7 y (2.3)	5.0 (2.1)	NS		2.7 (2.3)	<0.01	
>80	3 (5.1)	83.0 (1.4)	4.3 (2.9)	NS		2.3 (1.2)	NS	
Marital status	58		6.1			4.6		
Unmarried	6 (10.3)		5.1 (1.7)	NS		4.8 (2.7)	NS	
Married	40 (69.0)		6.5 (1.7)	<0.02		5.2 (2.5)	<0.02	
Widow/widower	8 (13.8)		5.5 (2.7)	NS		3.5 (2.9)	NS	
Single	4 (6.9)		4.8 (2.9)	NS		2.0 (1.0)	<0.02	
Married/in a relationship	40 (69.0)		6.5 (1.7)	<0.02	<0.01 (vs not in a relationship)	5.2 (2.5)	<0.02	<0.03 (vs not in a relationship)
Not in a relationship	18 (31.0)		5.2 (1.7)	<0.02		3.6 (2.5)	NS	
Education	58		6.1			4.7		
Elementary school	12 (20.7)		5.1 (2.2)	NS		3.9 (2.7)	NS	
Middle school	19 (32.8)		6.5 (2.0)	NS		5.0 (2.5)	NS	
High school	16 (27.6)		6.1 (1.8)	NS		4.8 (2.7)	NS	
University	11 (19.0)		6.6 (1.8)	NS		4.9 (2.5)	NS	
Months on dialysis	55	48.9 [1–317] (64.3)	6.2			4.8		
<12	16 (29.1)	8.1 (3.8)	6.1 (1.7)	NS		4.2 (1.9)	NS	
13–60	27 (49.1)	32.4 (15.2)	6.1 (2.4)	NS		4.7 (2.9)	NS	
>61	12 (21.8)	140.6 (84.7)	6.8 (1.6)	NS		5.7 (2.8)	NS	
<24	28 (50.9)	12.6 (6.5)	6.3 (2.1)	NS		5.0 (2.3)	NS	

(Cont'd...)

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	Participants		CL score						
			Present			Expected in 5 years			
			Mean (SD)	p-value	p-value	Mean (SD)	p-value	p-value	
									Sample mean vs population mean t-test
25–47	9 (16.4)	35.4 (4.8)	4.9 (2.5)	NS			3.3 (2.9)	NS	
>48	18 (32.7)	112.4 (79.9)	6.7 (1.8)	NS			5.2 (2.8)	NS	
<i>Dialysis duration (hours)</i>	58		6.2 (2.1)				4.7 (2.7)		
<4	14 (24.1)		6.0 (2.7)	NS			3.9 (2.5)	NS	
4	35 (60.4)		5.9 (1.8)	NS			4.7 (2.7)	NS	
>4	9 (15.5)		7.7 (1.0)	<0.01			5.9 (2.5)	NS	
<i>Vascular access</i>	57								
AVF	53 (93.0)		6.2 (2.1)	NS			4.8 (2.7)	NS	
Wrist	26 (49.1)		6.0 (1.9)	NS			4.4 (2.3)	NS	
Forearm	14 (26.4)		6.7 (2.5)	NS			4.9 (3.0)	NS	
Elbow	11 (20.7)		6.0 (1.8)	NS			5.0 (2.9)	NS	
Arm	2 (3.8)		4.5 (1.5)	NS			4.5 (3.5)	NS	
Not tunneled catheter	2 (3.5)		4.0 (0)	NS	N/S (vs AVF)		2.5 (0.5)	NS	N/S (vs AVF)
Tunneled catheter	2 (3.5)		8 (0)	NS	N/S (vs AVF)		5.5 (1.5)	NS	N/S (vs AVF)
<i>Kidney graft in the past</i>	59		6.1				4.8		
Yes	5 (8.5)		7.0 (1.8)	NS	N/S (vs “no”)		7.6 (2.4)	NS	<0.02 (vs “no”)
No	54 (91.5)		6.1 (2.1)	NS			4.5 (2.5)	<0.01	
<i>Willingness to kidney graft</i>	56		6.1				4.8		
Yes	32 (57.1)		6.5 (1.8)	NS	N/S (vs no)		5.4 (2.7)	NS	<0.04 (vs no)
No	24 (42.9)		5.6 (2.2)	NS			3.4 (2.0)	<0.01	
<i>Fulfillment of medical recommendations</i>	55		6.3				4.9		
Yes	39 (70.9)		6.3 (2.2)	NS			5.2 (2.7)	NS	N/S (vs no)
No	16 (29.1)		6.3 (1.7)	NS			4.2 (2.5)	NS	
Partly	7 (13.5)		6.7 (1.7)	NS			4.1 (2.5)	NS	
Irregularly	10 (19.2)		6.1 (1.8)	NS			5.1 (2.9)	NS	
Regularly	35 (67.3)		6.2 (2.2)	NS			4.7 (2.6)	NS	
<i>Kt/V</i>	57	1.31 [0.82–1.89] (0.34)	6.2				4.7		
<1	6 (10.5)	0.88 (0.11)	5.5 (1.9)	NS			3.3 (1.9)	NS	
1–1.5	40 (70.2)	1.23 (0.13)	6.2 (2.1)	NS			4.6 (2.7)	NS	
>1.5	11 (19.3)	1.78 (0.42)	6.6 (2.0)	NS			6.2 (2.4)	<0.05	
<1.2	22 (38.6)	1.04 (0.12)	6.2 (2.1)	NS			4.5 (2.5)	NS	
1.2–1.3	13 (22.8)	1.26 (0.03)	6.2 (2.0)	NS			5.0 (2.8)	NS	
>1.3	22 (19.3)	1.52 (0.17)	6.1 (2.1)	NS			4.8 (2.8)	NS	
<i>URR</i>	58	0.66 [0.42–0.90] (0.07)	6.2				4.7		
<0.6	15 (25.9)	0.56 (0.04)	6.2 (2.2)	NS			4.4 (2.4)	NS	
0.6–0.7	28 (48.3)	0.66 (0.02)	6.1 (2.0)	NS			4.6 (2.6)	NS	
0.7–0.8	13 (22.4)	0.73 (0.03)	6.1 (2.2)	NS			5.3 (2.9)	NS	
>0.8	2 (3.4)	0.85 (0.05)	7.0 (1.0)	NS			4.5 (2.5)	NS	
<i>UF (mL)</i>	58	2,298 [300–4,200] (910)	6.1				4.8		
<1,000	8 (13.8)	650 (206)	5.5 (1.9)	NS			4.0 (2.4)	NS	
1,000–2,000	12 (20.7)	1,675 (200)	6.3 (2.4)	NS			4.8 (2.8)	NS	
2,000–3,000	25 (43.1)	2,532 (260)	6.2 (2.2)	NS			4.6 (2.6)	NS	
>3,000	13 (22.4)	3,438 (253)	6.5 (1.6)	NS			5.2 (2.7)	NS	

N/S: Not significant

CL was chosen because it is fast and easy to explain to the patients. During the survey, the patients received two pictures of the ladder. The hypothetical rungs of the ladders were numbered from 0 to 10. The patients were informed that the top of the ladder represented the best possible SwL, and the bottom rung represented the worst possible SwL. Higher scores indicated higher SwL. On the first ladder, the patients were asked to indicate how they felt and to express their personal stance at that particular moment. On the second ladder, they were asked to indicate their expected stance in 5 years.¹⁵

Statistical Analysis

Demographic information was analyzed using the frequencies and average calculations. The SD were computed for continuous variables. The variables were compared with Student's t-tests. Both the sample means *vs* the population means and the sample means *vs* the sample means of two independent groups were compared with t-tests. A p-value less than 0.05 was considered to be statistically significant.

FINDINGS

Of the 135 patients who received HD thrice a week in a single outpatient center in May 2016, 59 patients returned the questionnaires and were further evaluated. Among the study participants, there were 40 males (67.8%) and 19 females (32.2%) who ranged in age from 28 to 84 (average age, 63.3 years and SD = 12.3; Table 1).

The factors that may have affected the SwL as assessed by the CL (CL-SwL) and the CL-SwL expected in 5 years were analyzed. The following factors were considered: gender, age (10-year categories), marital status, education, months on dialysis, duration of a single HD, vascular access, kidney graft in the past, graft willingness in the future, fulfillment of medical recommendations, and dialysis adequacy (i.e., Kt/V, URR and UF; Table 1); t-tests were used to describe differences in the CL-SwL scores.

Initially, the influence of each factor on both the present and expected 5-year CL-SwL scores was evaluated. There were no statistically significant relationships in either the present or expected 5-year CL-SwL scores and the factors of gender, education, months on dialysis, type of vascular access [arteriovenous fistula (AVF), not tunneled catheter, or tunneled catheter], fulfillment of medical recommendations, URR, or UF (Table 1).

A group of ESRD patients (71–80 years) rated their SwL expected in 5 years as significantly lower ($p < 0.01$). For the other age groups, there were no significant differences. Despite the low rating of the SwL expected in 5 years in the oldest group (>80 years), the group size was too small (three patients) to prove a significant difference.

The strong relationship between marital status and both present and expected 5-year CL-SwLs has been demonstrated (Table 1). The married group rated both their SwL at present ($p < 0.02$) and expected in 5 years ($p < 0.02$) significantly higher than the groups of single, unmarried, and widows/widowers in one group. The differences between in a relationship and not in a relationship were even more significant ($p < 0.01$ for present CL-SwL and $p < 0.03$ for the expected 5-year CL-SwL).

The patients whose dialysis took over 4 hours rated their present SwL higher ($p < 0.01$) than others, while there were no differences in the CL-SwL expected in 5 years (Table 1). Former kidney grafts did not significantly affect the present CL-SwL score. However, the patients who had undergone a kidney graft in the past expected their SwL to be significantly higher in 5 years ($p < 0.02$). Similarly, the willingness to undergo a kidney graft did not change the present CL-SwL, but the individuals who did not desire a kidney graft rated their expected in 5 years CL-SwL as significantly lower ($p < 0.01$ *vs* total population, $p = 0.035$ *vs* yes to kidney graft; Table 1).

A Kt/V over 1.5 was associated with a significantly higher expected 5-year CL-SwL ($p < 0.05$), while there was no significant relation between Kt/V and the present CL-SwL (Table 1).

DISCUSSION

The ESRD is an important cause of morbidity and mortality,¹⁰ and it is associated with an increased risk of cognitive impairment.⁶ One-third of ESRD patients who are dialyzed thrice a week exhibit moderate-to-severe cognitive impairment. This occurs despite the meeting of HD quality standards.¹⁶

Hemodialysis is an example of a passive treatment. The patients have to come to the HD center for several hours thrice a week. Patients are connected to blood purification systems by medical staff and have to meet other dialyzed patients. Between the HD sessions, the patients are expected to adhere to a restricted diet and to take medications.¹⁷

The SwL scores of ESRD patients were evaluated with a CL survey. Despite its simplicity, the CL survey is the most important one. The CL survey is easy to understand, fast to perform, and easy to repeat. We accounted for the self-reported CL-SwL scores rated by the patients. Next, we compared the SwL ratings with the demographic factors and clinical parameters (Table 1).

Dialysis adequacy was assessed according to Kt/V.¹⁸ Additionally, the URR and UF were evaluated. A Kt/V over 1.5 was associated with significantly higher CL-SwL scores expected in 5 years ($p < 0.05$), while there was no significant relation between Kt/V and the present CL-SwL (Table 1). We did not find significant relations between

the present or expected 5-year CL-SwL scores and URR or UF (Table 1).

According to the patients, the vascular access method influences their lifestyles. The hospitalization of ESRD patients contributes to complications of vascular access in 15 to 20% cases.⁴ Arteriovenous fistulas, compared with arteriovenous grafts and central venous catheters, are associated with better clinical outcomes and lower costs.⁴ The ESRD, HD, and vascular access have major influences on the quality of life.¹² However, we excluded the relations between the present and expected 5-year CL-SwL scores with the type of vascular access (Table 1). This means that the type of vascular access affects the costs but not the self-reported CL-SwL scores.

Additionally, we did not find significant relationship between present or expected 5-year CL-SwL scores and gender, education, months on dialysis, or fulfillment of medical recommendations (Table 1). These factors were not associated with SwL.

Both an age of 61 to 70 years and dialysis lasting over 4 hours were associated with significantly higher present CL-SwL ($p < 0.05$ and $p < 0.01$ respectively), while undergoing a kidney graft in the past and the willingness to undergo a kidney graft in the future were associated with significantly higher expected 5-year CL-SwL ($p < 0.02$ and $p < 0.04$ respectively). Being in a relationship was associated with both significantly higher present and expected 5-year CL-SwL scores ($p < 0.02$ and $p < 0.02$ respectively; Table 1).

An age of 71 to 80 years old, the absence of a kidney graft in the past and the unwillingness to have a kidney graft done in the future were associated with significantly lower ($p < 0.01$, $p < 0.01$, and $p < 0.01$ respectively) expected 5-year CL-SwL scores, while not being in a relationship was associated with significantly lower present and expected 5-year CL-SwL scores ($p < 0.01$ and $p < 0.03$ respectively; Table 1).

CONCLUSION

- CL is a useful tool for SwL measurement. It is a single, meaningful, self-reported method that is fast and easy to perform with ESRD patients.
- The relationship between present and expected 5-year CL-SwL scores and patient-related factors, such as gender, education, fulfillment of medical recommendations, and dialysis-related parameters including months on dialysis, type of vascular access, URR, and UF were excluded.
- The results indicated a highly positive relationship between high expected 5-year CL-SwL and the following factors: being in a relationship, having a kidney

graft performed in the past and willingness to have a kidney graft done in the future.

- Despite the relations to dialysis parameters, the group of ESRD patient who were not in a relationship, those who did not undergo kidney grafts in the past, those who did not desire a kidney graft in the future, and the eldest patients expected their SwL in 5 years to be significantly lower. Psychological support should be offered to these ESRD patients first.

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