

NONCLINICAL FACTORS ASSOCIATED WITH TREATMENT WITH PERITONEAL DIALYSIS IN ESRD PATIENTS IN TAIWAN

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◆◆ **Objectives:** Less than 10% of end-stage renal disease (ESRD) patients in Taiwan receive peritoneal dialysis (PD), which reveals the situation of underutilization of PD. We thus aimed to investigate factors associated with treatment with PD in ESRD patients in Taiwan.

◆◆ **Patients:** Patients that were 18 years of age or older and had been on dialysis for at least 3 months since 2001 were recruited and interviewed with a structured questionnaire.

◆◆ **Results:** 98 hemodialysis (HD) and 102 PD patients were recruited. In univariate analysis, age, sex, level of education, employment status, marital status, traffic time, family support, patient cognition, and receptivity were correlated with treatment with PD. Multivariate analysis showed that patients that were not married ($p = 0.006$), that spent more time traveling to the dialysis clinic ($p = 0.006$), that were not emergent at the start of dialysis ($p = 0.003$), and that had better family support ($p = 0.045$), a higher cognition of dialysis ($p = 0.034$), and stronger receptivity to dialysis ($p < 0.001$) were more likely to receive PD.

◆◆ **Conclusions:** We recommend patients follow the standard process to obtain more exhaustive information, consultation, and early referral. In addition, we suggest healthcare providers remind patients to take into account such nonclinical factors as family support and patient receptivity when they choose their dialysis modality.

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The incidence and prevalence rates of end-stage renal disease (ESRD) in Taiwan (418 and 2226 per million in 2006) have persisted at high levels in recent years (1). Although there is a small fraction of patients receiving

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renal transplant therapy, most patients need to take long-term dialysis. Medical expenses arising therein become a heavy burden on the finances of the National Health Insurance (2).

Among ESRD patients in Taiwan, the proportion using peritoneal dialysis (PD) is much lower than that using hemodialysis (HD). An annual report of dialysis utilization in Taiwan shows that the proportions of PD and HD utilization are 8.5% and 91.5% respectively (3). This imbalanced result indicates that PD is underused. It has been reported that nephrologists in Canada and in the United Kingdom thought 37% and 38% respectively of ESRD patients should be treated with PD to optimize patients' clinical outcomes (4,5). Although nephrologists in other countries suggested a relatively low proportion, it still stands at 20% and above (6–8).

Generally, a chronic kidney disease (CKD) patient should follow a standard process to receive complete resources of medical care, education, and consultation. Information on dialysis modality is expected to be provided to a patient with CKD stage 4 or earlier. A patient will then select an appropriate dialysis modality based on his/her preference or doctor's suggestion. Practically, however, some patients either receive insufficient information or are not willing to participate in the process (9). The result is that a portion of patients do not follow the standard process, thereby increasing the possibility of emergent dialysis; that is, patients did not have a planned start for dialysis and proceeded to acute HD through temporary HD catheters.

When patients face choosing a dialysis modality, they may not be sure what to do or what should be taken into account. From a patient's point of view, consideration of clinical evaluations is a professional matter and they might feel that they should follow their doctors' advice. Thus, the remaining factors patients can take into account may be nonclinical factors. In the present study, therefore, we proposed to identify nonclinical factors associated with treatment with PD for ESRD patients in Taiwan.

SUBJECTS AND METHODS

In this cross-sectional study, ESRD patients that were in care from 2001 to 2007 in a medical center in Mid-Taiwan were recruited and interviewed using a structured questionnaire. Patients were eligible to be recruited if they (1) had been on dialysis for at least 3 months and had not changed dialysis modality, (2) had no contraindications, (3) were able to communicate in Chinese or Taiwanese with clear consciousness, and (4) consented to participate in the study. The study protocol was approved by the Institutional Review Board of the Changhua Christian Hospital.

The structured interview questionnaire collects mainly patient data related to social demographic characteristics, emergent status of the start of dialysis, family support, cognition of dialysis modality, and receptivity to dialysis therapy. Family support was measured by a mini-scale that included four items selected from a national survey (10). Each item was measured on a Likert 5-point scale, resulting in the scale ranging from 4 to 20. The cognition scale of dialysis was established by referring to the checklist of *Health Education for Dialysis Therapy* announced by the Bureau of National Health Insurance. There are eight items rated on a 4-point scale, including patient's understanding of dialysis modality, prior physical preparation, and frequencies and other settings of dialysis (see Table 1). Moreover, because of the essential difference in operation between PD and HD therapies, we thought that patient receptivity to dialysis was also an important factor associated with the modality. We thus constructed a scale of patient receptivity to dialysis that included patient's perceived feeling of the medical services, rec-

ognition of self-care, and impact of dialysis therapy on daily living. In total, there were ten 4-point items within the scale (see Table 2); the expected range of the scale was 10 – 40.

Four interviewers attended a 4-hour training session and conducted several mock one-to-one interviews before the main task. The PD patients were invited by telephone to participate. The consenting patients were interviewed in an unused clinic, the HD unit, or a waiting room. All the interviews were conducted in 2008 between January and April.

The validity of the instrument was assessed by 7 physicians and professionals. The content validity index for each item and scale in the questionnaire achieved 0.8 or above. A pilot sample of 20 patients was also recruited to examine the reliability of the instrument for modification. Cronbach's coefficient alpha was 0.820, 0.794, and 0.826 for family support scale, cognition scale, and receptivity of dialysis scale, respectively.

Means and standard deviations for continuous data and frequencies and percentages for categorical data are presented to demonstrate patient characteristics. Categorical variables with sparse cells (*i.e.*, too few patients in at least 1 subgroup) were collapsed as binary in the analysis. Univariate analyses, including two-sample *t*-tests for continuous variables and univariate logistic regression analysis or chi-square tests for categorical variables, were conducted to study correlations between factors and dialysis modality. Factors with a *p* value < 0.1 in univariate analyses were then entered into the multiple logistic regression model to re-verify the significance without a model selection process. All statistical analyses were performed using SPSS version 12.0 (SPSS Inc., Chicago, IL, USA).

TABLE 1
Items and Descriptive Results of Patient Cognition of Dialysis Modality

Item	HD ^a	PD ^a
1. Do you understand well the principle of each dialysis modality?	2.17±0.93	3.25±0.91
2. Do you know what prior physical preparation is needed for each modality, such as preparation of vascular access and insertion of the PD catheter?	2.30±0.98	3.36±0.94
3. Do you understand well in what way and in what place each modality is taken?	2.41±0.98	3.44±0.87
4. Do you know how frequently and how long each modality takes?	2.26±0.97	3.49±0.91
5. Do you understand well what you need to pay attention to in diet for each modality?	2.04±0.87	2.96±1.03
6. Do you understand well the possible complications of each modality?	2.03±0.90	2.39±1.07
7. Do you understand well the contraindications to each modality?	1.90±0.86	2.07±1.05
8. Overall, do you understand well the advantages and disadvantages of each modality?	2.05±0.89	3.27±0.90

HD = hemodialysis; PD = peritoneal dialysis.

^a All items are rated on a Likert 4-point scale, where 1 = completely disagree, 2 = tend to disagree, 3 = tend to agree, and 4 = completely agree and are presented as mean±SD.

TABLE 2
Items and Descriptive Results of Patients' Perceived Receptivity to Dialysis Therapy

Item	HD ^a	PD ^a
1. I do mind if any visual change to my body occurs.	2.32±0.95	3.15±0.81
2. I do mind if people know that I receive dialysis.	1.97±1.10	2.66±1.02
3. I feel useless if I need somebody's help to have my meal or go to the toilet over a long-term.	2.53±1.10	3.47±0.79
4. I feel uncomfortable going to hospitals frequently.	2.38±1.02	3.34±0.74
5. Getting medical service in clinics often reminds me that I am ill.	2.13±1.03	3.41±0.69
6. I feel safe only when medical care is operated by healthcare providers, even if it is not complicated. (negative item) ^b	2.07±0.89	1.54±1.17
7. I hope I am able to perform self-care when I am ill, for as long as my health status allows.	3.40±0.73	3.75±0.54
8. I worry about self-care. (negative item) ^b	1.07±1.03	0.69±0.92
9. I hope dialysis therapy will not interfere with my social activities.	2.87±0.95	3.60±0.65
10. I hope I can schedule dialysis by myself.	2.84±0.95	3.71±0.57

HD = hemodialysis; PD = peritoneal dialysis.

^a All items are rated on a Likert 4-point scale, where 1 = completely disagree, 2 = tend to disagree, 3 = tend to agree, and 4 = completely agree and are presented as mean±SD.

^b Patient receptivity scores were calculated by summing these 10 items after the 2 negative items were recoded as descending.

RESULTS

Of 221 patients that were requested to participate in the study, 18 refused. The overall participation rate was 92%. Among the 203 patients identified as eligible for participation, only 3 did not complete the interview. Patient characteristics are listed in Table 3. For PD and HD groups of patients respectively, 29% and 53% were males, average age was 54 and 62 years, and most patients were married (71% and 86%), had lower level of education (67% and 85%), and were unemployed (70% and 88%). While approximately half the patients in each group were rated 18.5 – 24 in body mass index measurement (defined as normal according to the cutoffs suggested by Department of Health in Taiwan), 14% and 17% in the two groups were higher than 27 (obese). In addition, the proportions of emergent dialysis were 36% and 62% in PD and HD groups, on average, and are displayed year by year in Figure 1.

Results of univariate analysis (Table 3) showed that sex ($p = 0.001$), age ($p < 0.001$), educational level ($p = 0.005$), marital status ($p = 0.046$), employment status ($p = 0.003$), family support ($p = 0.002$), traffic time to the dialysis clinic ($p < 0.001$), emergent dialysis ($p < 0.001$), cognition of dialysis ($p < 0.001$), and receptivity to dialysis ($p < 0.001$) were significantly correlated with treatment by PD.

Two models were considered in the multivariate analysis (Table 4). In model 1, in which patient cognition of and receptivity to dialysis were ignored, sex, employment status, marital status, emergent dialysis, traffic time, and family support showed significant association with

treatment by PD. In model 2, a more saturated model, most of the demographic factors were not significant except for marital status; emergent dialysis, traffic time, family support, patient cognition of dialysis, and receptivity to dialysis were significantly associated with treatment by PD. Otherwise, by model diagnosis, variables in both models have no remarkable collinearity (variance inflation factor < 2), the models were well fit ($p = 0.23$ and 0.63 for models 1 and 2 by Hosmer–Lemeshow test), and they had good explanatory ability (Nagelkerke $R^2 = 0.42$ and 0.74).

DISCUSSION

In the present study, we aimed to identify nonclinical factors associated with dialysis modality. We should first recall that, because the ratio of PD:HD utilization in this medical center (approximately 1:1.4) is different from the prevalent group in Taiwan, the overall patient characteristics in the study are not representative of the Taiwanese dialysis population owing to the overweight PD group. The only way to understand patient characteristics is to interpret them by PD/HD groups.

While age distributions of PD/HD groups in our study are similar to the Taiwanese dialysis population (11), the proportion of females in the PD group shows an increase of almost 10%. Selection bias may influence results of this study. For example, proportions of unmarried and patient cognition in the PD group are slightly overestimated. The median age of patients is also lower than in some other populations (1,11–13). This may be due partially to poorer survival of elderly patients and the

TABLE 3

Distribution of Patient Characteristics by Dialysis Modality^a

Characteristic ^b	HD (n=98)	PD (n=102)
Male ^c	53%	29%
Age (years) ^c	61.8±11.5	53.6±14.7
Higher level of education ^d	15%	33%
Employed ^d	12%	30%
Lives with family members	85%	85%
Married ^e	86%	71%
Traffic time to the clinic <20 min ^c	48%	22%
Body mass index (BMI)		
<18.5	6%	6%
18.5≤BMI<24	49%	55%
24≤BMI<27	28%	25%
≥27	17%	14%
Perceived economic status		
Not good	37%	29%
Just fine	44%	55%
Good	19%	16%
Emergent dialysis ^c	62%	36%
Family support score ^d	16.7±2.9	17.8±2.3
Cognition of dialysis ^c	17.2±6.5	24.2±5.8
Receptivity to dialysis ^c	25.3±4.9	32.8±4.1

HD = hemodialysis; PD = peritoneal dialysis.

^a Proportions for categorical variables and mean±SD for continuous variables are displayed.^b Univariate logistic regression analysis was applied to study level of education, employment status, living arrangement, marital status, and traffic time; otherwise, chi-square test and 2-sample t-test were used to study categorical and continuous variables respectively.^c $p < 0.001$.^d $p < 0.01$.^e $p < 0.05$.

slightly low median age of new patients in Taiwan (1,11).

Note that, in the multivariate analysis, the most significant demographic factors in model 1 are not significant in model 2. This is because patient cognition of and receptivity to dialysis are expected to be better in PD groups after a significant length of time on dialysis. Thus, some factors become nonsignificant after adding the two factors into the model. Therefore, those significant demographic factors in model 1 should be considered important explanatory factors for patient choice of modality. To understand associations between dialysis modality and patient cognition of and receptivity to dialysis, together with other factors, we focus on the results from model 2 in the following discussion.

Family support has been recognized as important among nonclinical factors (14). The result in our study agrees with this argument, yet the difference in family

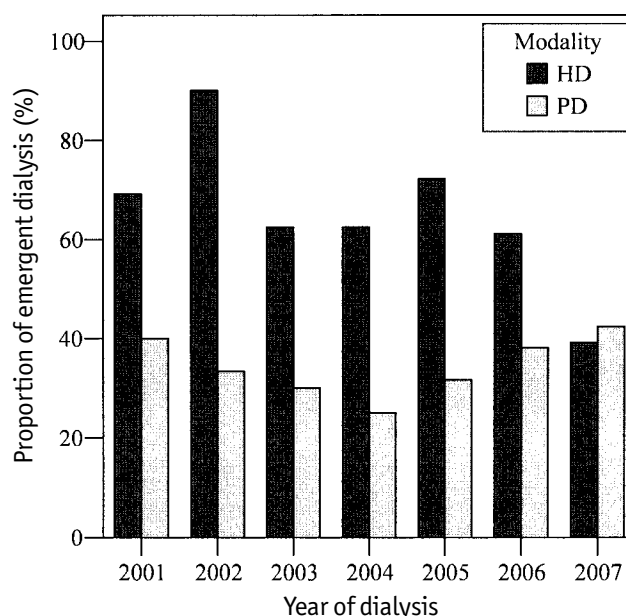


Figure 1 — Proportions of emergent dialysis at the start of dialysis in hemodialysis (HD) and peritoneal dialysis (PD) groups from 2001 to 2007.

TABLE 4

Factors Associated with Treatment with Peritoneal Dialysis Based on Multiple Logistic Regression Analysis^a

Variable	Model 1		Model 2	
	OR	95% CI	OR	95% CI
Male	0.33	(0.15–0.70) ^b	0.47	(0.17–1.30)
Age (per 10 years)	0.78	(0.60–1.00)	0.86	(0.61–1.22)
Higher level of education	2.24	(0.91–5.54)	2.07	(0.62–6.91)
Employed	2.93	(1.16–7.40) ^c	1.12	(0.31–4.03)
Married	0.31	(0.12–0.75) ^b	0.16	(0.04–0.59) ^b
Emergent dialysis	0.33	(0.17–0.66) ^b	0.22	(0.08–0.60) ^b
Longer traffic time	3.57	(1.70–7.54) ^d	4.35	(1.53–12.4) ^b
Family support	1.26	(1.08–1.47) ^b	1.25	(1.01–1.54) ^c
Cognition of dialysis			1.09	(1.01–1.17) ^c
Receptivity to dialysis			1.47	(1.29–1.67) ^d

Model 1 = patient cognition of and receptivity to dialysis were ignored; OR = odds ratio; 95% CI = 95% confidence interval.

^a Receipt of peritoneal dialysis was coded as 1.^b $p < 0.01$.^c $p < 0.05$.^d $p < 0.001$.

support score between the two groups does not appear to be distinct. Married patients were found to be less likely to receive PD in this study. This is out of line with the international literature (15,16). The reasons behind it are not clear but it may be due to the low divorce rate among Taiwanese elderly. It appears that approximately

half the non-married patients in the PD group in our study are single and most of them are living with relatives and are relatively young. Therefore, we think this is more likely the nature of the population.

The result of longer traffic time in the PD group seems to be similar to that reported in the literature, yet the reasons behind it may be dissimilar. In Taiwan, there are 459 clinics providing HD, while only 64 clinics among them can provide PD as well. Thus, the fact that HD patients spend less time traveling to the clinic is due to the wider distribution of HD clinics. To give PD patients access that is more convenient and provide greater choice, we recommend that the government should map out guidance to increase the number of PD clinics.

The scale of patient receptivity was developed to help in the understanding of patient preference of dialysis modality. Whether a treatment is acceptable depends on patient receptivity; for that reason, patients should take into account their preference when making their decision. Analysis of the receptivity scale showed that patients would prefer self-care but worry about choosing it. This indicates that patients need more competence capacity or friendly guidance.

That prevalent PD patients have a better cognition of dialysis may imply PD therapy is more technical for patients and patients that selected PD are expected to have a better understanding of dialysis. Thus, to ensure that patients understand well a dialysis modality is the first course when they face selection. Analysis of the cognition scale indicated that PD patients have relatively poor cognition of "possible complications" and "contraindications to dialysis," while HD patients had generally poor cognition of all items. In summary, cognition of dialysis in the PD group (24.2 ± 5.8) was better than in the HD group (17.2 ± 6.5). Receptivity to dialysis in the PD group (32.8 ± 4.1) was also stronger than in the HD group (25.3 ± 4.9). Furthermore, similar to other studies (17), for ESRD patients that received emergent dialysis at the start, the odds of treatment by PD were much lower. Figure 1 shows that the proportions of patients that received emergent dialysis in the HD group were apparently higher than in the PD group, on average. Hence, it is important to reduce the possibility of emergent dialysis. We therefore strongly recommend that CKD patients follow the standard process to obtain more exhaustive information, consultation, and early referral.

Although all patients recruited in the sample had no contraindications, 149 patients reported that their doctor's suggestion is an important factor that influenced their decision; the other 51 patients thought their doctors determined the dialysis modality. In fact, in our experience, doctors usually respect the patient's decision

except for clinical considerations, such as contraindications. Nevertheless, this indicates that doctors play a key role in the selection process. As mentioned above, clinical evaluations are usually thought to be professional and one might follow their doctor's advice. Hence, based on the results in this research, we suggest healthcare providers, in addition to providing professional advice on clinical evaluations, remind patients to take into account nonclinical factors such as family support and patient receptivity. Moreover, patients should be prompted again and again to understand well dialysis modalities.

LIMITATIONS

Due to the fact that patients in the study had been on dialysis for up to 7 years, some measures were likely to be biased, especially patient cognition of and receptivity to dialysis, because they are going to be better in the PD group after significant lengths of time of dialysis. We tried to explore associated factors based on 88 patients that received dialysis during the past 2 years. Most results were similar to those we proposed based on the whole sample. Nonetheless, this is a preliminary study with several limitations and needs to be repeated in an incident group of patients.

While PD patients were interviewed in an unused clinic, HD patients were interviewed in the HD unit. Potential bias due to patients being interviewed in a public place may have arisen.

DISCLOSURES

The authors do not have any conflicts of interest to declare.

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