Testing a Theoretical Model Predicting Uncertainty and Depression in Patients Undergoing Renal Replacement Therapy in Korea

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Purpose The purpose of this study was to test hypothesized relationships among experiences of uncertainty, depression, and social support in a sample of subjects undergoing renal replacement therapy in Korea.

Methods Path analysis was used in the sample to examine the relationships among depression and experiences of uncertainty, direct social support, indirect social support, and demographic variables. The size of the sample was 104 patients. Patients received either hemodialysis at one of three clinics or continuous ambulatory peritoneal dialysis.

Results One hundred and four subjects participated in the study. It was found that 6.2% of variance in uncertainty was predicted by direct social support (β = −.267), and 46.2% of variance in depression was predicted by three variables: direct social support (β = −.517), economic status (β = .299), and number of admissions (β = .275). Unlike the theoretical model, experiences of uncertainty could not predict depression.

Conclusion The effectiveness of social support in relieving experiences of uncertainty and consequently depression was shown in this study. Moreover, depression in this population could be predicted by direct social support, economic status, and frequency of admission. The study was needed to investigate the relationship between depression and experiences of uncertainty with time covariates, as well as to find the factors that influence depression in patients with chronic renal failure.

Key Words depression, social support, uncertainty

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INTRODUCTION

Chronic renal failure (CRF) is a chronic deterioration in renal functioning, which results in accumulation of nitrogenous wastes, extracellular fluid volume, or changes in plasma composition (Edelstein, 1998). It requires people to adapt to unforeseeable changes in their health status and to receive kidney transplantation or dialysis treatment to alleviate symptoms and prolong their lives. Hemodialysis (HD) and continuous ambulatory peritoneal dialysis (CAPD) are prevalent renal replacement therapies (RRT). According to the report of the Korean Society of Nephrology (KSN) (2003), it was estimated that in 2002 the total number of patients undergoing HD was approximately 20,000, and the number of patients treated with CAPD was roughly 5,700 based on the online registry program on the KSN website. In spite of its therapeutic efficacy, patients undergoing dialysis experience inherent uncertainty in their life, which could arise from the prospect of premature death (Polaschek, 2003).

Uncertainty is “the inability to determine the meaning of illness-related events”. It occurs when patients cannot interpret the illness-related situation due to a lack of sufficient signals (Mishel, 1988). Mishel’s Uncertainty Model lists the components of sufficient cues as stimuli frame, cognitive capacity, and structure provided. Patients are supposed to develop their own cognitive schema for illness to interpret their situation based on stimuli frames. A stimuli frame is composed of symptom patterns, event familiarity, and event congruence. Consistency in degree of symptoms, being familiar with illness situations, and consistency between the expected and the experienced in illness-related events form a stimuli frame in patients’ cognition. Consequently, having adequate information about the illness situation usually leads to less uncertainty. The ability to interpret the stimuli frame is determined by cognitive capacity and structure provided. Cognitive capacity refers to a person’s ability to process the information. Depending on cognitive capacity, patients sense either only limited information or overload information from the stimuli frame. Structure provided refers to the resources available to help patients interpret stimuli frames and consists of credible authority, social support and education. By using structure provided, patients reduce their level of uncertainty either directly or indirectly. Based on three precedents of uncertainty such as stimuli frame, cognitive capacity and structure provided, a person appraises uncertainty as danger or opportunity, which leads to different coping strategies to reduce levels of uncertainty. Appropriate coping strategies for uncertain situations facilitate adaptation (Mishel; Mishel & Braden, 1988).

In fact, there are limited studies about uncertainty and its consequences for patients undergoing RRT. A few studies have stated that uncertainty is a common experience in RRT patients. Lok (1996) reported that 64 patients undergoing HD ranked decreasing social life and uncertainty about the future as the two highest psychosocial stressors. Bihl, Ferrans, and Powers (1988) also reported that uncertainty about the future was one of the most highly ranked stressors for patients on CAPD and HD. Uncertainty is a serious concern, because it affects psychosocial adaptation and disease outcomes (McCormick, 2002). Previous studies have reported that the experience of uncertainty is related to an increase in stress and is considered to be a factor of disturbed coping with illnesses (Mishel, Hostetter, King, & Graham, 1984; Mishel & Sorenson, 1991).

Emotional distress or mood state has been evaluated in terms of the outcomes of uncertainty (Mishel & Sorenson, 1991). Prior studies have reported that in patients with chronic illness, there is a positive relationship between uncertainty and depression (Webster & Christman, 1988; Wineman, 1990). Beck (1974) stated that depression occurs by means of negative appraisal of self, environment, and the future. Exacerbation in illness increases depression through heightened uncertainty in patients with chronic illnesses such as multiple sclerosis (Kroencke, Denney, & Lynch, 2001). Similarly, depression in CAPD patients can be explained by psychological factors, including hopelessness or stress. In particular, having incurable CRF and depending on RRT for one’s whole life are stressful conditions that can lead to depression (Kim et al., 2002). For this reason,
depression is reported to be the most common psychological disorder in patients undergoing RRT (Lopes et al., 2002; Troidle et al., 2003; Watnick, Kirwin, Mahnensmith, & Concato, 2003).

One factor that can reduce the level of uncertainty is to provide social support—an aspect of structure provided in Mishel’s Uncertainty Model. Social support, the main psychosocial variable in health-related studies (Kasl & Cobb, 1966), implies various forms of social relationship, meaningful social contact, and social networks, as well as actual social support (Norbeck, Lindsey, & Carriere, 1981). The benefits of social support have been investigated in previous studies in terms of preventing uncertainty (Mishel, 1988; Mishel & Braden, 1988) and buffering the impact of crisis through means of emotional and informational support (House, 1981).

Social support can be seen as an essential key to overcoming stress and challenges in life, and it is recognized as a predictor of individual health and wellbeing, and functions as a mediating or buffering factor for stress.

Social support, however, is defined differently by different investigators. Kahn and Antonucci (1980) defined social support in terms of emotion, confirmation, and assistance. House (1981) classified social support into themes of emotion, appraisal, information, and instrument. In this paper, Park’s (1985) definitions of direct and indirect social support were used. Direct social support is the social support that is actually received from the social network. Examples include intimacy, confidence, and trust that individuals receive from others. Indirect social support includes information, material and appraisal that individuals think of accessing when in a crisis situation (Park).

It is also necessary to consider factors that influence depression, including socioeconomic status, age, and hospitalization. The relationships between depression and socioeconomic status (Wang, 2001), hospitalization (Finkelstein & Finkelstein, 2000; Kimmel et al., 2000; Lopes et al., 2002), age (Lopes et al.), and length of illness (Weinert & Catanzaro, 1994) have been well documented. Therefore, demographic variables, including age, economic status, length of illness and number of admissions, will be considered in this study. In addition, the number of children in a family and family size will be included based on personal clinical experience.

As briefly discussed above, it is well known that uncertainty and depression are prevalent in patients undergoing RRT. The relationship between uncertainty and depression, however, has not been well studied. Exploring this relationship may provide fundamental knowledge that can be used to improve patients’ coping and adaptation. In addition, exploring the association of social support with depression and

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**Figure 1.** Three-stage hypothesized path model of uncertainty and depression.
uncertainty may provide information that can be used to refine social support programs to relieve depression and uncertainty in patients undergoing RRT.

For this reason, the purpose of this study was to test a hypothesized relationship between experiences of uncertainty and depression in a sample of subjects undergoing RRT in Korea based on Mishel’s Uncertainty Model (Figure 1). Specifically, this study tested a three-stage model (e.g., precipitants, uncertainty, and consequences of uncertainty) based on Mishel’s Uncertainty Theory. The outcome variable was depression and the antecedent variables were social support and demographic variables, including age, economic status, number of admissions, number of children in the family, family size, and length of illness. Direct social support and indirect social support were also considered.

The model resulted in the following hypotheses that were tested:

- Hypothesis 1: indirect social support and direct social support will negatively predict uncertainty.
- Hypothesis 2: uncertainty, length of illness, number of children in the family, family size, and number of admissions will positively predict depression, while age and economic status will negatively predict depression.

**METHODS**

**Research design**

This was a secondary data analysis of cross-sectional data collected from June 1998 to December 1999 to analyze factors influencing uncertainty and depression among subjects with CRF. The original study was a descriptive correlational design to examine the relationships among uncertainty, depression, and social support in patients undergoing HD in Korea (Jung, Lee, Jeon, & Lee, 1999). The subjects were recruited from three HD clinics and one pharmaceutical company where patients with CAPD registered. After obtaining consent from the subjects, the data were collected in the subjects’ homes for those receiving CAPD and in the clinics for those undergoing HD.

**Samples**

The sample consisted of 104 patients with CRF. Nunnally and Bernstein (1994) stated that one should have at least 10 subjects per predictor for a stable prediction equation. A hypothesized model will be trimmed based on the results of analysis. For this reason, the number of subjects in the study was appropriate. The criteria for a subject’s inclusion in this study were as follows: (a) had undergone either CAPD or HD for at least 3 months after being diagnosed; (b) was over 20 years old; and (c) understood the study and agreed to participate. Subjects with a medical history of depression or who were on medication for depression were excluded.

Sociodemographic information including the type of treatment, age, length of illness, education, marital status, number of children in the family, family size, number of admissions, economic status, and employment status were obtained.

**Measurements**

**Social support**

Social support was measured by the Social Support Scale developed by Park (1985). She defined social support as direct social support, which is actually received, and indirect social support, which is perceived in terms of emotion, information, material, and appraisal. Direct social support and indirect social support were measured on a 5-point Likert scale from 1 (very unlikely) to 5 (very likely). A 15-item scale measured direct social support, while a 25-item scale measured indirect social support. The possible scores for direct social support ranged from 15 to 75, whereas the range of scores for indirect social support ranged from 25 to 125. The higher the score, the more social support received. A previous study supports the construct and content validity (Park). The internal consistency of the scale in this study was appropriate: $\alpha = .92$. Direct social support and indirect social support were .80 and .93, respectively.

**Uncertainty**

Uncertainty was measured by the Uncertainty Scale (So, 1996). The original Uncertainty Scale (Mishel, 1981) was revised and modified into a 22-item scale.
for the Korean population. It includes four subscales: ambiguity, complexity, deficient information, and unpredictability. Only the total score, however, was used in this study. All items were rated on a 5-point Likert scale from 1 to 5 and added after reversing the ratings of the eight items, yielding scores ranging from 22 to 110. The higher the score, the higher the level of uncertainty. The author, So, reported construct validity and content validity. The internal consistency reliability coefficient in this study was reasonable: $\alpha = .71$.

**Depression**

This study used Hahn et al.’s (1986) revised Beck Depression Index (BDI) (Beck, 1967) for the Korean population to measure affective, behavioral, cognitive, motivational and vegetative aspects of depression. Hahn and colleagues reported its construct validity and content validity. The BDI, a 4-point Likert scale from 0 to 3, has 21 items. The possible scores range from 0 to 63. The higher the score, the more severe the depression. A score greater than 19 indicates moderate-severe depression. The internal consistency reliability coefficient in this study was .91.

**Data analysis**

Descriptive statistics including means and standard deviations were calculated for patients receiving HD and CAPD and the total sample on all variables. Pearson’s correlation coefficients were calculated to examine the relationship among all variables for the sample. Assumptions related to causal modeling were tested, including residual analysis. The results of residual analysis showed that there was no violation of assumptions. To test the proposed conceptual model, path analysis with hierarchical regression techniques using SPSS version 13 (SPSS Inc., Chicago, IL, USA) was used in the sample to examine the relationships among depression, uncertainty including direct social support and indirect social support, and demographic variables. The independent variables were entered in the following order: uncertainty, direct social support, and demographic variables, followed by a selection of variables that were of interest. The significance level of $p \leq .05$ was used for standardized beta regression coefficients and for the adjusted $R^2$. A correlation matrix consisting of demographic variables and studying variables were examined for the magnitude of the relationships. Correlation coefficients were from low to moderate in the expected direction except for one relationship between uncertainty and depression (Table 1).

**RESULTS**

Table 2 illustrates the sociodemographic characteristics of the participants. Of the 104 subjects, males comprised 57.7% ($n = 60$). Almost 56% of patients

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### Table 1

**Pearson’s Product Moment Correlations Among Study Variables ($N = 104$)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Length of illness</td>
<td>.053</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Economic status</td>
<td>.069</td>
<td>.283*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Number of children</td>
<td>.299*</td>
<td>-.042</td>
<td>-.092</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Number of family members</td>
<td>-.213†</td>
<td>-.056</td>
<td>-.016</td>
<td>.264*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Number of admissions</td>
<td>.566*</td>
<td>.125</td>
<td>.065</td>
<td>.103</td>
<td>-.052</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Uncertainty</td>
<td>.227†</td>
<td>-.303*</td>
<td>-.200</td>
<td>.046</td>
<td>-.162</td>
<td>-.101</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Depression</td>
<td>.211†</td>
<td>.073</td>
<td>.411*</td>
<td>-.018</td>
<td>-.247†</td>
<td>.260*</td>
<td>.141</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Indirect social support</td>
<td>-.088</td>
<td>-.117</td>
<td>-.132</td>
<td>.023</td>
<td>.193</td>
<td>.042</td>
<td>-.211†</td>
<td>-.253*</td>
<td></td>
</tr>
</tbody>
</table>

*$p < .01$; †$p < .05$. 

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received HD, while 44% received CAPD. Age ranged from 20 to 70 years, with a mean age of 41 years. The mean length of illness was 50.8 months. Just over 50% had received high school education and around 65% were married. Subjects had a mean of 2.33 children and 3.69 family members. The number of admissions ranged from 0 to 8, with a mean of 3.42. Approximately 60% of participants reported middle economic status, while almost 40% reported low economic status; 68.3% were out of work.

Table 3 shows the descriptive statistics of the study variables. As no study has measured uncertainty in individuals with CRF, our results could not be directly compared with other studies. The mean BDI for depression was 17.67, indicating moderate depression. Watnick and associates (2003) reported that 44% of participants had a BDI score of > 15. Patel, Shah, Peterson, and Kimmel (2002) reported a mean BDI of 12.5 ± 10.6 in patients undergoing HD.

The results in this study showed that the patients had depressive symptoms. Three variables predicted 46.2% of the variance in depression: direct social support (β = −.517), economic status (β = .299), and

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**Table 2**

*Sociodemographic Characteristics of the Participants (N = 104)*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male 60 (57.7)</th>
<th>Female 44 (42.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>41.17 ± 11.68</td>
<td></td>
</tr>
<tr>
<td>Length of illness (months)</td>
<td>50.80 ± 42.80</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education</th>
<th>Primary school graduate 4 (3.8)</th>
<th>Middle school graduate 11 (10.6)</th>
<th>High school graduate 54 (51.9)</th>
<th>University graduate or higher 35 (33.7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marital status</td>
<td>Never married 25 (24.0)</td>
<td>Married 68 (65.4)</td>
<td>Divorced 4 (3.8)</td>
<td>Separated 7 (6.7)</td>
</tr>
</tbody>
</table>
| Number of children in the family | 2.33 ± 1.16                   | Number of family members | 3.69 ± 1.66 | Number of admissions 3.42 ± 2.09 | Watts (University of Michigan) \[8\]

<table>
<thead>
<tr>
<th>Economic status</th>
<th>Middle 63 (60.6)</th>
<th>Low 41 (39.4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment status</td>
<td>Employed 33 (31.7)</td>
<td>Unemployed 71 (68.3)</td>
</tr>
</tbody>
</table>

Note. Values are n (%) or mean ± SD.

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**Table 3**

*Values of Study Variables (N = 104)*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean ± SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct social support</td>
<td>48.62 ± 7.69</td>
<td>26–72</td>
</tr>
<tr>
<td>Indirect social support</td>
<td>87.62 ± 12.58</td>
<td>54–119</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>64.15 ± 7.94</td>
<td>41–87</td>
</tr>
<tr>
<td>Depression</td>
<td>17.67 ± 10.01</td>
<td>0–52</td>
</tr>
</tbody>
</table>

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**Table 4**

*Results of Testing Theoretical Model for Study Variables (N = 104)*

<table>
<thead>
<tr>
<th>Variables</th>
<th>β</th>
<th>Adjusted $R^2$</th>
<th>Change $R^2$</th>
<th>$F$</th>
<th>$t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct social support</td>
<td>−.517</td>
<td>.297</td>
<td>.297</td>
<td>42.305*</td>
<td>−6.846†</td>
</tr>
<tr>
<td>Economic status</td>
<td>.299</td>
<td>.391</td>
<td>.094</td>
<td>32.451*</td>
<td>3.959†</td>
</tr>
<tr>
<td>Number of admissions</td>
<td>.275</td>
<td>.462</td>
<td>.071</td>
<td>29.010*</td>
<td>3.688†</td>
</tr>
<tr>
<td>Uncertainty</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct social support</td>
<td>−.267</td>
<td>.062</td>
<td>.062</td>
<td>7.853*</td>
<td>−2.802*</td>
</tr>
</tbody>
</table>

*p < .01; †p < .001.
number of admissions (β = .275). Direct social support, economic status, and number of admissions emerged as significant predictors in this analysis. In other words, patients who received more direct social support perceived themselves as less depressed, whereas patients of high economic status and who experienced frequent hospitalizations perceived themselves as more depressed. One variable predicted 6.2% of the variance in uncertainty: direct social support (β = −.267). Direct social support was a significant predictor for uncertainty.

Patients who directly received social support perceived less uncertainty (Table 4). The trimmed model was created after the model variables that were not statistically significant were eliminated (Figure 2). Therefore, variables including indirect social support, age, length of illness, number of children in the family, and family size were excluded from the theoretical model. Based on the process of comparing the trimmed model against the hypothesized model (Pedhazur, 1982), the relative fits of the trimmed model and hypothesized model were not significantly different (χ²(0.7395) = 12.44, df = 9). This suggested that the additional variables in the hypothesized model did not contribute to the model, and the trimmed model was a parsimonious model.

**DISCUSSION**

The first hypothesis that indirect social support and direct social support will negatively predict uncertainty was partly supported: patients who received more direct social support reported less uncertainty. The hypothesis that patients receiving more indirect social support will report less uncertainty, however, was not supported. In spite of the effectiveness of social support, as Cormier-Daigle and Stewart (1997) mentioned, different types of social support may have different effects in this population. In this sense, received or tangible support may be more effective than perceived social support in relieving uncertainty in this group. Another possible explanation was that this group was in frequent contact with health care providers in clinics or within a pharmaceutical company and so had easy access to information from health care providers. For this reason, indirect social support might be rated as less effective in decreasing uncertainty in this group.

The second hypothesis that uncertainty, length of illness, number of children, family size, and the number of admissions will positively predict depression while age and economic status will negatively predict depression was also partly supported: direct social support, economic status, and number of admissions were predictive of depression, whereas indirect social support, age, number of children, and family size were not predictive of depression. Even though uncertainty and length of illness predicted depression in previous studies (Weinert & Catanzaro, 1994), the relationships were not proven in this study. The relationship between age and depression was not proven. On the contrary, the relationship between number of admissions and depression turned out to be the
same as in previous studies (Finkelstein & Finkelstein, 2000).

The results of this study indicated that patients had mild or moderate levels of depression, which is consistent with recent evidence with respect to depression in patients undergoing RRT. Watnick and associates (2003) found that 44% of participants had a BDI score of > 15, and Patel and associates (2002) reported a mean BDI score of 12.5 in patients undergoing HD. Only the mean score of depression was examined. The relationship between depression and demographic data was not tested.

Unlike prior studies, the reason why uncertainty did not predict depression in this population is that patients’ depression may come from another source. To manage chronic illness successfully, individuals with CRF must undertake many aspects of their own treatment on a regular and long-term basis, including managing diet, fluids, medications, frequent complications and morbidity episodes, and dialysis treatments (Curtin & Mapes, 2001). According to previous studies (Kimmel, 2002; Kimmel et al., 2000), the issue of loss has been associated with depression in this population. Examples included loss of kidney function, wellbeing, place in family and workplace, time, financial resources, and sexual function. Therefore, it is possible that another variable may explain the variance in depression. In the study, complications could be one predictor of depression in patients with CRF, because the main reason for hospitalizations was the occurrence of complications such as anemia, hypertension, or peritonitis.

Possibly, the properties of uncertainty in patients with CRF are different from those in patients with other illnesses. In fact, Mishel’s Uncertainty Theory was developed and replicated in a population with gynecological cancer (Mishel et al., 1984; Mishel & Sorenson, 1991). Thus, the theory may not explain uncertainty in a population with CRF. In addition, the theory is composed of several aspects, such as ambiguity and complexity. Even though this study used a total score for uncertainty, it is possible that certain aspects of uncertainty are more compelling for other populations. In this case, patients usually used machines for HD or some solution for CAPD and, as time went on, patients became used to the treatment. So, patients may have ambiguity about their state of illness rather than complexities related to treatment.

Uncertainty is a common experience for patients with chronic illnesses. This theoretical model not only gives the whole path to explain the predictors and their outcomes, but also implies how to manage uncertainty using the path. There are limitations, however, in this study. First, because depression and uncertainty are not static concepts, longitudinal designs using time covariates will give more insight into the change in depression and uncertainty over time. Second, this study investigated the role of uncertainty in the illness model in a secondary analysis, which suggests the possibility of excluding relevant variables in the theoretical model and of limitation of generalization. Third, patients could have different experiences in terms of uncertainty or depression depending on their therapy, whether it be HD or CAPD; therefore, the whole model in this study may not look into the effects of treatment differences. Fourth, more reliable tools to measure socioeconomic status are needed. In this study, the participants evaluated their economic status in terms of low, middle, or high status based on their perception of their socioeconomic status. The majority of subjects reported their economic status as low or middle, which might produce statistical limitations.

CONCLUSION

The findings from this study have suggested several points for health care providers. First, as stated above, depression in patients with CRF is a very important variable to be managed, because it relates to high risks, such as mortality. Considering the effectiveness of specific types of social support, interventions to relieve depression should be offered to patients with CRF. Second, economic status can be one psychological factor influencing depression, which suggests the extension of health insurance coverage or establishment of policies for patients with CAPD to receive benefits. Third, the significant relationship between number
of admissions and depression implies that management of complications may decrease patients’ depression. Fourth, regular psychiatric counseling to patients with CRF should be considered as part of the treatment process.

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