Factors influencing self-management behaviors of patients with hemodialysis

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ABSTRACT

Improving the level of self-management is a useful way to cut down the incidence of mortality and complications and enhance quality of life. The purpose of this study was to explore the potential effects of positive and negative emotions on self-management behavior among persons undergoing hemodialysis. A descriptive study and secondary analysis was conducted using two surveys that were administered two years apart (2014, 2016). A total of 250 hemodialysis patients were included in the first survey and 75 participated in the two-year follow-up survey in 2016. Self-efficacy, serenity, and depression were measured at baseline, and self-management was assessed at the two-year follow-up. Baseline self-efficacy (r = .36, p = .002) and serenity (r = .32, p = .005) were positively associated with follow-up self-management behavior. Hierarchical multiple regression analysis showed baseline self-efficacy was an important predictor of self-management behaviors, explaining 10.7% of the variance (F = 5.14, p = .003). This study demonstrated the importance of maintaining a positive psychological state, particularly self-efficacy and serenity, while coping with a long-term chronic disease. Improving self-efficacy may increase self-management behavior of patients undergoing hemodialysis or potentially of patients with other chronic therapies or conditions.

Keywords: Emotions, Renal dialysis, Self-efficacy, Self-management

INTRODUCTION

End stage renal disease (ESRD) is the final stage of chronic kidney disease (CKD), and unless a transplant is received, patients require renal replacement therapy, such as dialysis, for the remainder of their lives. The incidence and prevalence of ESRD are increasing worldwide, and South Korea has also shown a rapid increase in ESRD of approximately 10% annually since 2001[1]. Patients with ESRD experience many medically-required demands and lifestyle changes, such as regular hemodialysis treatment 2–3 times per week, restricted fluid intake, dietary changes, and medication, and these changes require active and comprehensive self-management[2]. Improving self-management of patients who require hemodialysis can be an effective means to reduce mortality and complications, and enhancing quality of life [3]. However, factors that support self-management of hemodialysis patients are not well known.

Self-management in context of hemodialysis as patients’ positive efforts to oversee and participate in their health care to optimize their health, prevent complications, control symptoms, marshal medical resources, and decrease the intrusion of the disease into their preferred lifestyle [2]. There are five core self-management skills: problem-solving, decision making, resource utilization, the formation of patient-provider partnership and action planning. Thus, self-management involves more than simply making changes in disease-related behavior; it also involves adapting to and coping with changes in lifestyle as a result of disease.

Optimal self-management must be supported by self-control [4]. Self-control is the ability to control one’s thoughts, emotions, and behaviors to achieve intended goals or standards. Self-control is a highly adaptive and important ego function, and proper self-control requires psychological resources [5]. In previous research, positive emotions were found to supply resources for self-control [6]. When these psychological resources are depleted, people experience difficulties with self-control. Positive emotions, which restore ego and strengthen resources after depletion, can improve this situation. Recently, there has been heightened interest in successful methods for coping with disease based on studies of positive emotions...
charactersitics and resources in humans; positive emotions are expected to be a useful resource for self-management behaviors [7].

In the field of positive psychology, empirical findings have demonstrated the salutary functions of positive emotions in humans, grounded in theories that support their adaptive functions [6]. One notable theory is the “Broaden-and-Build Theory of Positive Emotions”, in which positive emotions lead to long-term growth and progress by broadening thoughts and behaviors and building resources [8]. As shown in Figure 1, positive emotions, such as hope and love, are linked to health and achievement by expanding behaviors and relationships, which in turn lead to accumulation of personal resources, such as knowledge, skill and social support [9]. According to this theory, positive emotions enhance personal resources and coping ability, and thus we can anticipate that they will also have a beneficial effect on self-management behaviors in hemodialysis patients. However, theoretical models are valuable and useful in developing effective interventions only when they are based on empirical research. Therefore, it is necessary to empirically investigate the relationship between positive emotions and self-management behaviors.

Individuals who experienced a high level of positive emotions have been found to be more successful in coping throughout the course of their disease [10]. Self-efficacy is the belief that one can successfully resolve a certain problem by one’s own ability, which helps individuals maintain their behaviors in the face of difficulties and to recover after failures. Ultimately, self-efficacy can enhance individual performance and lead to more successful outcomes. Serenity is a sense of peace and tranquility as opposed to anxiety and confusion, and it forms the basis of a happy mind [11]. This emotional experience of inner peace is sustained irrespective of life events and implies harmony of body, spirit, and mind. In contrast, depression is a negative emotion commonly experienced by hemodialysis patients and a risk factor negatively affecting self-management [12]. Depressed patient’s exhibit low self-confidence and decisiveness. Clinically, depression impedes the seeking and use of appropriate treatment.

Thus far, studies of human emotions have predominantly discussed negative emotions and negative effects, whereas positive emotions and beneficial effects have rarely been considered [13]. Research on the Broaden-and-Build Theory of Positive Emotions indicates that positive emotions enable more adaptive coping in daily living [8]. However, aside from theoretical models of positive emotions, few existing studies have analyzed the effects of positive emotions on self-management behaviors of patients with chronic disease. Therefore, this study focuses on self-efficacy and serenity as positive emotion experienced during the course of hemodialysis patients’ disease, aiming to test their association with self-management behaviors.

MATERIALS AND METHODS

Study design

This study uses a descriptive design which aimed to examine the relationship between positive emotions and self-management behaviors of patients undergoing hemodialysis.

Participants

This investigation used secondary data from two surveys within a period of two-year. A total of 250 hemodialysis patients were included in the first survey, conducted in January 2014 [14]; of these, 75 participated in the two-year follow-up survey around January 2016 [15]. Participants were recruited from nine hemodialysis clinics in Seoul.

Measurements

1) Self-efficacy

Self-efficacy refers to belief in one’s ability to succeed in specific situations or to achieve specific tasks. The original instrument to measure self-efficacy, developed by Sherer et al. [16], consists of 17 items measured on a 5-point scale. The present study employed modified version of Shere et al.’s scale for Korean patients receiving hemodialysis [17], which included 7 items measured on a 4-point scale from 0 (strongly disagree) to 3 (strongly agree), for a total score ranging from 0 to 21. Higher scores indicate stronger self-efficacy. Cronbach’s alpha in a previous study for the modified instrument was .88 [17]; Cronbach’s alpha in the present study was .82.

2) Serenity

Serenity is a low-intensity positive emotion that reflects human integration and peacefulness. Self-reported serenity among hemodialysis patients was assessed using one item similar in meaning to “positive affect” from the psychological health problem items of the quality of life instrument in the Short Form Health Survey (SF-12) [18]: “Have you felt calm and peaceful during the past four weeks?” Responses were recorded on a 5-point Likert scale from 1 (all the time) to 5 (none of the time). The score (1-5) was reversed and converted into a score from 0 to 100. The higher the score, the more serene the participant.
3) Depression

Depression was measured using the Hospital Anxiety and Depression Scale (HADS) [19]. The HADS comprises two subscales with seven items each for anxiety and depression; the seven depression items were adopted in this study. Items were scored on a 4-point Likert scale from 0 (not at all) to 3 (often), for a total score ranging from 0 to 21. Scores of 0-7 are considered normal; scores of 8-10 are considered borderline; and scores of 11 or higher indicate probable presence of depression. Cronbach’s alpha for the developed scale was .84 and was .79 in current study.

4) Self-management behavior

The Hemodialysis Self-Management Instrument [20] was used to measure self-management behavior. This scale has 20 items in four subscales: problem solving (5 items), partnership (4 items), and self-care (7 items), and emotional management (4 items). Each item is scored on a 4-point scale from 1 (never) to 4 (always). Total scores range from 20 to 80, with higher scores reflecting higher levels of self-management. Cronbach’s alpha was .87 for the developed scale and was .91 for the present study.

Data Collection and Procedures

The Institutional Review Board of K University approved this study as a secondary analysis of data. Original data were collected in two ways: through in-person visits to the hemodialysis clinic by a researcher, and/or through online support groups for hemodialysis patients. The researcher explained the purpose and content of the study, and then obtained informed consent from patients who agreed to participate in the study. Positive (self-efficacy and serenity) and negative (depression) variables were measured at baseline (T1), and self-management was measured at follow-up (T2) (Figure 2).

Figure2. Schematic diagram

RESULTS AND DISCUSSION

Demographic and clinical characteristics

The mean age of participants was 47.3, and the majority were male (68%). The majority was married (62.7%) and had an education level of high school or lower (62.7%); 52.0% had a monthly income above 2 million won; 42.7% were employed; and 62.7% reported they had a specific religion. Mean years on hemodialysis was 8.3. Hypertension was the most common primary disease (44.0%), followed by glomerulonephritis (30.7%). 40.0% of participants were waiting for kidney transplantation (Table 1).

Table1. Demographic and Clinical Variables of Hemodialysis Patients (N=75)

| Characteristics                  | Categories                | n (%) or M ± SD | Self-management behavior | t or F (p) |
|----------------------------------|---------------------------|-----------------|--------------------------|------------|
| Age (years)                      |                           |                 |                          |            |
| < 39                             | 14 (18.7)                 | 60.6 ± 8.5      | 6.70                     |            |
| ≥ 39                             | 39 (52.0)                 | 61.3 ± 7.7      | (.002)                   |            |
| Monthly income (10,000 won)      | ≤ 200                     | 63.1 ± 9.8      | (.368)                   |            |
| > 200                            | 39 (52.0)                 | 65.0 ± 8.2      | (.359)                   |            |
| Employment status                | Employed                  | 64.4 ± 8.5      | (.27)                    |            |
| Unemployed                       | 43 (57.3)                 | 63.7 ± 9.4      | (.785)                   |            |
| Religion                         | Yes                       | 64.2 ± 8.8      | (.16)                    |            |
| No                               | 28 (37.3)                 | 63.9 ± 9.5      | (.875)                   |            |
| Duration of dialysis (years)     |                           |                 |                          | (.021)     |
| < 5                              | 25 (33.3)                 | 66.0 ± 9.4      | 1.01                     | (.343)     |
| ≥ 5                              | 21 (28.0)                 | 64.1 ± 8.9      | (.368)                   | (.021)     |
| Primary disease                  | Diabetes mellitus         | 64.9 ± 9.9      | 1.13                     | (.021)     |
| Hypertension                     | 33 (44.0)                 | 64.7 ± 9.8      | (.343)                   | (.021)     |
| Waiting for kidney transplantation| Yes                      | 64.7 ± 9.6      | .47                      | (.643)     |
| No                               | 45 (60.0)                 | 63.7 ± 8.6      | (.021)                   | (.021)     |

Differences of self-management behavior according to general characteristics

There were significant differences in self-management behavior by categories of age, gender, and marital status (F = 6.70, p = .002; t = −2.90, p = .005; F = 4.06, p = .021, respectively). However, there were no significant differences in self-management behavior observed by categories for education level, employment status, and religion, duration of dialysis, primary disease, or waiting for kidney transplant (Table 1).

The degree of self-efficacy, serenity, depression and self-
Mean scores of self-efficacy and serenity were 12.5 and 55.7, respectively. The depression means score was 6.7, with 51.7% participants classified as non-depressed, 32.0% as borderline, and 13.3% as probable cases of depression. The mean total self-management behavior score at the two-year follow-up was 64.1. Problem-solving was the highest self-management behavior subscale item with 17.1 points, followed by self-care (23.0), partnership (12.6), and emotional management (11.4) (Table 2).

**Table 2. Emotions and self-management behavior measured in this study (N=75)**

| Variable                        | M ± SD | Possible range | Actual range |
|---------------------------------|--------|----------------|--------------|
| Positive emotion (T1)           |        |                |              |
| Self-efficacy                   | 12.5 ± 3.4 | 0-21           | 5-18         |
| Serenity                        | 55.7 ± 28.9 | 0-100          | 0-100        |
| Negative emotion (T1)           |        |                |              |
| Depression                      | 6.7 ± 3.7 | 0-21           | 0-15         |
| Self-management behavior (T2)   | 64.1 ± 9.0 | 20-80          | 43-78        |
| Problem-solving                 | 17.1 ± 2.5 | 5-20           | 10-20        |
| Partnership                     | 12.6 ± 2.2 | 4-16           | 7-16         |
| Self-care                       | 23.0 ± 3.6 | 7-28           | 15-28        |
| Emotional management            | 11.4 ± 2.2 | 4-16           | 5-16         |

T1 was measured at baseline; T2 was measured at follow-up.

**Relationships of self-efficacy, serenity, depression and self-management behavior**

In bivariate analyses at baseline, self-efficacy and serenity were negatively correlated with depression (r = -.25, p = .031; r = -.55, p < .001), and self-efficacy was positively associated with serenity (r = .36, p = .002). Further, baseline self-efficacy (r = .36, p = .002) and serenity (r = .32, p = .005) were positively associated with follow-up self-management behavior, and depression was negatively associated with follow-up self-management behavior (r = -.27, p = .021) (Table 3).

**Table 3. Relationships of self-Efficacy, serenity, depression, and self-management behavior**

| Variable                        | 2.  | 3.  | 4.  |
|---------------------------------|-----|-----|-----|
|                               | r   | p   | p   |
| 1. Self-efficacy (T1)           | -.36(0.002) | -.25(0.031) | -.36(0.002) |
| 2. Serenity (T1)                | -.55(<0.001) | .32 (.005) |
| 3. Depression (T1)              | -.27(0.021) |
| 4. Self-management behavior (T2)| 1   |

T1 was measured at baseline; T2 was done at follow-up.

**Predictors of self-management behavior**

In multivariate analyses, the predictors of follow-up self-management among hemodialysis patients are shown in Table 4. The variance inflation factor (VIF), used to check for multi-co-linearity, was 1.15–1.54, indicating no serious multi-co-linearity problems among the predictor variables. The Durbin-Watson value was 1.81, indicating that the residuals from linear regression were uncorrelated. Depression was entered in Model 1 and accounted for 7.1% of the variance in self-management behavior at follow-up (F = 5.56, p = .021). The two positively oriented measures (self-efficacy and serenity) were entered in Model 2. These variables explained 10.7% of the variance (F = 5.14, p = .003); baseline self-efficacy (β = .27, p = .021) was a significant predictor of follow-up self-management behavior.

**Table 4. Predictors of self-management behavior**

| Variable         | Model 1 | Model 2 |
|------------------|---------|---------|
|                  | β (p)   | β (p)   |
| Depression       | -.27 (.021) | -.11 (.394) |
| Self-efficacy    | .27 (.021) |
| Serenity         | .32 (.005) |
| R²               | .071    | .178    |
| R² change        | .077    |         |
| F (p)            | 5.56 (.021) | 5.14 (.003) |

**DISCUSSION**

This study adopted the Broaden-and-Build Theory of Positive Emotions as a framework to organize the present research. An analysis of the effects of positive emotions on self-management in hemodialysis patients was conducted and a significant relationship was found between positive emotions and self-management behavior. This indicates that in addition to controlling negative emotions like depression, reinforcing positive factors, such as self-efficacy and serenity, is also important in improving self-management behavior.

The participants in this study exhibited 64.1/80 points of self-management behavior, and among the subdomains of self-management behavior, problem-solving were the highest. We interpret this to mean that this is potentially a result of the high proportion of long-term dialysis patients in the sample, whose problem-solving ability had grown through a process of trial and error during the long period of their disease. Compared to a study by Li, Jiang, and Line [20], who used the same instruments as used in the present study to examine these variable among patients undergoing at a university hospital, the patients in our study showed higher overall self-management behavior scores; this is thought to be because our subjects had passed the acute phase and were in the stable chronic phase of the disease and had more well-developed self-management skills that were established over time.

The demographic factors associated with self-management behaviors were age, gender, and marital status. Young adult patients neglected self-management more than older adult patients. Previous studies have also found that hydration and other aspects of self-management are performed at a lower level in younger hemodialysis patients compared to patients aged 50 years or older [21]. Researchers have explained this based on the characteristics of the different age groups; young adults are more likely to overlook self-management due to their pursuit of independence and autonomy and their high workload, whereas older adults are more likely to engage in self-management due to greater awareness of their own mortality and more free time to cope with various treatment needs. Women performed self-management better than men, consistent with research.
in other countries \cite{20}. It appeared that women were better able to look after themselves; this may be because women are commonly in charge of housekeeping, which affects disease management in terms of diet and medication. Finally, married patients showed higher levels of self-management than unmarried patients, potentially suggesting that self-management was made easier with help from family and/or a spouse in meal preparation and medication \cite{21}.

Level of self-efficacy and serenity in this study were 12.5/21 and 55.7/100, separately in hemodialysis patients, demonstrating that despite the difficulties caused by chronic disease, patients were able to experience a positive psychological state in the process of coping with their disease. Thirty-four patients (45.3\%) demonstrated a clinically significant score of 8 or higher for depression as a negative emotion, demonstrating the co-occurrence of the negative as well as positive emotions and beliefs in stressful circumstances. Classically, stress-coping theory has focused on the negative emotion of distress. However, because positive emotions have been reported even in stressful circumstances for bereaved individuals or ones caring for an unwell spouse, modified stress-coping models have been proposed that also include positive emotions.\cite{22}. Our study found that hemodialysis patients experience positive emotions and beliefs (serenity and self-efficacy) amidst the constant stress of chronic disease, providing empirical evidence for the adaptive value of positive emotions and beliefs.

Hemodialysis patients who initially showed higher self-efficacy and serenity at baseline showed better performance of self-management behaviors at two-year follow-up. Similar results have been reported in patients with other chronic diseases, such as diabetes and rheumatism \cite{23, 24}. Higher perceived competence and motivation in diabetes patients was associated with higher levels of self-management, and at a one-year follow-up, these patients showed better control of blood glucose levels \cite{23}. Similarly, in rheumatoid arthritis patients, positive emotions showed a positive correlation with active coping, indicating that they could also affect self-management behaviors \cite{24}. Thus, considering the functions of positive emotions such as serenity, as well as positive beliefs of one’s self-efficacy, one might expect adaptive coping behaviors, such as self-management, during the course of disease.

The present study showed that higher self-efficacy was associated with better ability to cope with the various demands of disease. High self-belief and personal expectations allow patients to focus on the tasks at hand and to actively use coping strategies to effectively solve problems. Additionally, hemodialysis patients with higher levels of mental stability and peace (serenity) showed higher likelihood of performing self-management behaviors. Serenity is a relaxed positive emotion equivalent to “peace of mind,” which indicates internal peace and harmony in Eastern cultures, including those of Korea, China, and India \cite{11}. Our study demonstrated for the first time that maintaining a stable, calm mental state had a positive effect on self-management behaviors in patients with chronic disease. In the future, it will be necessary to investigate the effect of interventions that can provide mental peace and balance, such as medication, relaxation, and mindfulness training, on self-management behaviors in patients with chronic disease \cite{25-27}.

When the negative emotion of depression was added to the regression model to analyze the effects of emotions on self-management two years later, self-management behaviors decreased significantly, and explanatory power was 7.1\%. Similarly, a study by Li et al. \cite{20} in China, using the same instruments as the present study, also found that depression affected self-management behaviors. Depressed patients could not escape their negative thoughts, lacked cognitive flexibility, and demonstrated limitations in various coping strategies \cite{12}. However, when the positive factors of self-efficacy and serenity were added to the regression model, the effects of depression disappeared seemingly due to the statistical significance of self-efficacy. This provides empirical evidence for the “undoing” hypothesis of positive beliefs, demonstrating the importance of helping depressed individuals to experience positive beliefs or expectations \cite{8}. The undoing effect of positive beliefs or outlook can attenuate the effects of negative emotions and potentially restore individuals to a normal psychological state.

This study demonstrated that positive factors, such as self-efficacy and serenity, can promote self-management behaviors. Although an increasing number of studies have identified the functions of positive states, most have focused on healthy subjects. In this study, we used data from hemodialysis patients to provide empirical evidence of the effects of positive emotions in the context of health care and disease. Although preliminary, the results of this study are valuable in that they show that the positive emotions of self-efficacy and serenity were predictive of health-related behaviors of self-management among patients with chronic disease.

There are some limitations to the present study. Because serenity was measured by only a single question, subsequent studies will need to improve validity by using more multidimensional scales, such as the Serenity Scale or the Peace of Mind Scale. In addition, since self-management behavior was not measured at baseline, the statistical conclusion validity is threatened, since we cannot be certain whether and the extent that self-management behavior changed over time in our sample. In addition, the sample size of the study was relatively small, and we were able to conduct only a single follow-up survey regarding self-management behaviors. Therefore, it will be important to conduct a larger-scale study with repeated measurements to demonstrate the long-term effects of positive emotions.

**CONCLUSION**

This study examined the relationship between positive
emotions and beliefs and subsequently measured self-management behaviors in hemodialysis patients. This study demonstrated that positive factors, such as self-efficacy and serenity, can promote self-management behaviors. Results of this study showed depression, self-efficacy, and serenity affect self-management. Based on the Broaden-and-Build Theory of Positive Emotions, data demonstrated the potential adaptive effects of positive states in hemodialysis patients, thus providing empirical evidence that can be applied to nursing practice or in the clinical setting. Although preliminary, the results of this study are valuable in that they show that the positive emotions of self-efficacy and serenity were predictive of health-related behaviors of self-management among patients with chronic disease. It will be important for clinical nurses and family members to create a supportive environment that enables patients to experience positive emotions, and to instruct patients with chronic disease in methods to improve self-efficacy and serenity.

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