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Mechanism of Engaging Self-Management Behavior in Rural Heart Failure Patients

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Abstract

Aim—The purpose of this study was to examine the relationships among self-efficacy, patient activation and SM in rural heart failure patients discharged from critical access hospitals.

Background—Heart failure is one of the most disabling and resource-consuming chronic conditions. Compared to their urban counterparts, rural heart failure patients had higher healthcare utilizations and worse health outcomes. Self-management (SM) plays a significant role in improving patients' outcomes and reducing healthcare use. Despite persistent recommendations of SM, engagement in SM still remains low in rural heart failure patients. SM is a complex behavior, which is influenced by various factors. Evidence on the efficacy of interventions to promote SM is limited and inconsistent. One reason is that the mechanism of engagement of SM in the rural heart failure population has not been fully understood.

Methods—A correlational study was conducted using secondary data from a randomized control trial aimed to improve SM adherence. Path analysis was used to test the hypothesis of patient activation mediating the effect of self-efficacy on SM.

Results—Data were collected from a sample of 101 heart failure patients (37% males) with an average age of 70 years. The final model provided a good fit to the data, supporting the hypothesis that self-efficacy contributes to SM through activation.

Conclusion—The results of this study showed that effective SM interventions should be designed to include strategies to promote both self-efficacy and activation.

Keywords

Rural Health; Heart Failure; Patient Activation; Self-Efficacy; Self-Management

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1. Introduction

1.1. Background

Heart failure (HF), a major public health problem worldwide, is one of the most disabling and resource-consuming chronic conditions (Giamouzis. 2011, Ditewig et al. 2010). In the United States, heart failure contributed to significant productivity loss (Bloom et al. 2012), 12–15 million office visits, 6.5 million hospital days and approximately 32 billion U.S. dollars of healthcare expenditure in 2010 (Go et al. 2013). Compared to those from urban areas, heart failure patients discharged from rural hospitals had a higher 30-day readmission rate (Gamble et al. 2011, Kociol et al. 2011, Weeks et al. 2009). Furthermore, rural heart failure patients had a higher risk of 30-day and 1-year death following hospital discharge (Teng et al. 2014, Joynt et al. 2011).

Performing HF **self-management (SM)**, such as checking symptoms and weight daily, restricting sodium and fluid, taking medications as prescribed, exercising regularly and keeping scheduled follow-up appointments, proves to be effective for improving patients' outcomes (Lee et al. 2009) and reducing readmissions (Giordano. 2009, Jovicic et al. 2006). However, evidence indicated that many HF patients failed to routinely perform SM behaviors (Macabasco-O'Connell. 2011; Kato. 2009, Riegel. 2009a). Other than taking medications as prescribed (Riegel. 2009a, Macabasco-O'Connell et al. 2008), only 12% of HF patients monitored daily weight (Evangelista. 2008, van der Wal and Jaarsma. 2008); 20% followed a restricted sodium diet (Evangelista. 2008, van der Wal and Jaarsma. 2008); 35–53% exercised regularly (Riegel. 2009a); and 60% kept the scheduled follow-up appointments (Hernandez et al. 2010). Not engaging in the aforementioned SM behaviors is significantly associated with worsening symptoms (van der Wal. 2006), increased readmissions (Riegel. 2009a, van der Wal. 2010) and death (Hernandez et al. 2010, Wu. 2008).

HF self-management is a composite of multiple, complex behaviors that can be affected by various factors. Non-experimental studies showed significant correlations between **self-efficacy** and SM in HF patients (van der Wal. 2010, Bos-Touwen et al. 2015a, Peters-Klimm et al. 2013, Schnell-Hoehn et al. 2009). However, experimental studies failed to demonstrate that increased knowledge and self-efficacy led to increased SM behaviors in HF patients (Riegel. 2009a, Evangelista. 2008, Clark et al. 2009). To address the inconsistent evidence, researchers are starting to explore other potential determinants of HF self-management, such as patient activation.

Patient activation, the central concept in Wagner's chronic illness care models (Wagner et al. 2001), is defined by Hibbard as the degree to which the person is ready, willing, and able to engage in health behavior change and manage his/her own health (Lubetkin et al. 2010). Studies reported higher levels of patient activation contributed to greater engagement of SM behaviors in populations with various chronic conditions (e.g., heart disease (Wolever et al. 2011), hypertension (Cooper et al. 2011), diabetes (Begum et al. 2011)), leading to reduced healthcare uses (Begum et al. 2011, Greene and Hibbard. 2012). The significant relationship between activation and SM were also observed in HF patients (Bos-Touwen et al. 2015b). In addition, several studies reported that interventions aimed to improve SM behavior through

enhancing self-efficacy for SM (Lorig et al. 2009, Marks et al. 2005) also increased activation levels in people with multiple chronic conditions.

1.2. Study aims

In sum, consistent evidence revealed that both activation and self-efficacy play key roles in promoting HF SM behaviors. However, the interrelationship between activation and self-efficacy and their combined effect on SM have not been reported. To address the gap in knowledge, the **purpose** of this study was to examine the relationships between self-efficacy for SM, patient activation and SM in rural HF patients. It is hypothesized that self-efficacy could affect SM behaviors through the effect of patient activation. To test the hypothesis, the specific aims are to examine:

1. the relationships among self-efficacy for SM, patient activation and HF SM
2. whether patient activation accounts for, or mediates, the relationship between self-efficacy for SM and SM

2. Methods

2.1. Study Design

A correlational study design was used to evaluate relationships among self-efficacy, patient activation and SM in HF patients discharged from rural critical access hospitals. This secondary analysis used the baseline data from a randomized controlled trial titled “Patient AcTivated Care at Home (PATCH)” which was intended to examine the feasibility and efficacy of a 12-week home-based intervention to improve HF SM adherence (Young et al. 2014). The study was approved by the University of Nebraska Medical Center Institutional Review Board (IRB PROTOCOL # 228-13-EP) and hospital ethical committees.

2.2. Sample, setting and sample size estimation

Participants were recruited from two rural critical access hospitals in Southeast Nebraska. Patients were eligible for the study if they: 1) were age 21 or older; 2) had HF as one of their discharge diagnoses; 3) had New York Heart Association (NYHA) class II to IV HF or 4) had NYHA class I HF and at least one HF-related hospitalization or emergency department visit in the previous year; 5) were discharged to home; 5) passed a mini-cog screen test (Borson. 2000); 6) understood English; and 7) had access to a phone.

We excluded patients who: 1) had depressive symptoms (received a score of 3 or above on the Patient Health Questionnaire-2 (PHQ-2) (Anonymous 2008, Li. 2007); 2) were diagnosed with liver cirrhosis; 3) were diagnosed with chronic renal failure; and 4) were diagnosed with other end stage and/or terminal illness (e.g. cancer) which limited the patient’s SM capacity. The details regarding sample and setting has been previously reported (Young et al. 2014). To detect a medium effect correlation ($r = 0.28$) using a two sided test, 5% significance level test ($\alpha = 0.05$) with power 80% power ($\beta = 0.2$), the required sample size is approximately 98 ($n = 98$) (Hulley et al. 2013).

2.3. Measures and instruments

2.3.1. Self-efficacy for HF self-management (SM)—Self-efficacy for HF SM is defined as the confidence or belief in one's ability to manage various aspects of his/her HF and achieve desirable health outcomes (Riegel. 2009b). The Self-care of HF Index (SCHFI) Subscale C (i.e., self-care confidence scale) was used to assess self-efficacy for HF SM, which includes 6 items (questions 17–22)(Riegel. 2009b) on a 4-point Likert scale. Scores are standardized to range from 0 to 100, with higher scores indicating higher self-efficacy. The SCHFI has been widely used to assess the degree of confidence regarding SM in HF patients (Shively et al. 2012, Dennison et al. 2010, Dickson et al. 2013). Coefficient alpha on the 6-item self-care confidence scale was 0.827. There was also significant correlation between self-efficacy and SM ($r = 0.42$) (Riegel. 2009b).

2.3.2. Patient activation—Patient activation is defined as “an individual's knowledge, skill, and confidence in managing their health and health care”(Hibbard et al. 2005). Hibbard's Short Form of the Patient Activation Measure (PAM) with 13 items was used to assess patient activation. The short form has similar reliability and validity to the long form (22-item version) across different ages, genders and health condition statuses (Hibbard et al. 2005). Each item of the form was scored on the 5-point Likert response scale. For the ease of interpretation, the raw scores were transformed from the original metric to a 0–100 metric with higher scores indicating higher activation levels. PAM demonstrated high internal consistency (Cronbach alpha = 0.87) and great construct validity as evidenced by significant associations with levels of physical activity, medication adherence, health status, and quality of healthcare (Hibbard et al. 2005, Hibbard et al. 2004, Skolasky et al. 2011). PAM has been tested in various populations living with chronic complex condition (e.g., multiple scoliosis, arthritis, heart disease, diabetes).(Skolasky et al. 2011, Hibbard et al. 2010, Stepleman et al. 2010, Fowles et al. 2009, Dixon et al. 2009).

2.3.3. Heart failure self-management (SM)—HF SM is defined as engaging in behaviors that help maintain stability and control symptoms related to HF (Riegel. 2009a, Riegel. 2009b, Riegel et al. 2000). The 29-item Revised Heart Failure Self-Care Behavior Scale (RHFSCBS) was used to assess patients' SM behaviors. (Artinian. 2002) Each response is granted a score from 0 (none of the time) to 5 (all of the time)(Artinian. 2002). The internal reliability of this questionnaire is consistent with a Cronbach alpha level of .84 (Artinian. 2002).

2.4. Statistical analysis

First, demographic and clinical variables were analyzed using descriptive statistics. Means and standard deviations were used for continuous variables, while frequencies and percentages were used to report categorical variables. Secondly, Pearson's correlation coefficients were used to identify relationships among the variables of interest. Path analysis with maximum likelihood was used to conduct path analysis among self-efficacy, patient activation, and HF SM. Mediation was assessed following the steps outlined by Barron and Kenney(Baron and Kenny. 1986). The normality, linearity and homoscedasticity assumptions were tested and verified prior to conducting the path analysis (Kline. 2005). All data were analyzed using SPSS 20 and M-Plus7.

3. Results

3.1. Sample characteristics

A total of 101 participants' data were used for this analysis. The mean age was 70 ± 12 (years). The majority of participants were women (63%), White (95%), unemployed (71%), and had health insurance provided by Medicare (78%). Two-thirds of participants had annual household income of less than \$50,000 or an educational attainment of high school graduate or lower. All the patients had multiple comorbidities: hypertension (98.0%), coronary artery disease (94.1%), dyslipidemia (90.3%), arthritis (87.1%), diabetes mellitus (73.3%), leg edema (44.6%), chronic obstructive pulmonary disease (COPD) (38.6%), history of heart attack (20.8%), history of cerebrovascular accident (CVA) or stroke (17.8%), and cancer (6.9%). More than 90% of participants were classified as NYHA class II and III with the average EF of $55.8 \pm 11.1\%$ (Table 1). The descriptive data for the variables of interest are listed in Table 1.

3.2. Self-efficacy for SM, patient activation and self-management

At baseline, the average level of self-efficacy for SM was below the fiftieth percentile (46.8 ± 23.8 , range = 0–100). The average level of patient activation was slightly over the fiftieth percentile (57.02 ± 18.71 , range = 0–100). Self-management as at the sixtieth percentile (89.06 ± 19.74) (Table 2).

3.3. Aim1. Examine the relationships among self-efficacy for SM, patient activation and HF SM

Bivariate correlations showed significant relationships among the variables of interest. Self-efficacy for SM is positively related to patient activation ($r = 0.676$, $p < 0.001$), and HF SM ($r = 0.391$, $p < 0.001$), respectively. Patient activation was significantly associated with SM ($r = 0.324$, $p < 0.001$) (Table 2).

3.3. Aim2. Examine whether patient activation accounts for the relationship between self-efficacy for SM and HF SM

Path analysis was conducted to examine whether patient activation mediates the effect of self-efficacy on SM in HF patients based on the proposed model (Figure 1). According to Baron and Kenny's method (Baron and Kenny. 1986), the variable tested as a mediator has to meet three criteria. First, the independent variable (i.e., self-efficacy) is significantly correlated to the proposed mediator (i.e., patient activation). In this model, self-efficacy for SM had a significant association with patient activation ($\beta = 0.331$, $p < 0.001$) (Table 3). Secondly, the independent variable (i.e., self-efficacy) is significantly related to the outcome variable (i.e., HF SM). The bivariate analysis showed a significant correlation between self-efficacy and SM ($r = 0.391$, $p < 0.001$). Finally, two conditions are required for the existence of a mediator effect when all variables are tested simultaneously: 1) the mediator is significantly associated with the outcome variable and 2) the direct relationship between independent and outcome variables is not significant when tested with the proposed mediator (Judd and Kenny. 1981, James and Brett. 1984). In the proposed model, patient activation, the proposed mediator, was significantly associated with HF SM, the outcome

variable ($\beta = 0.279$, $P = 0.000$). Furthermore, self-efficacy for SM was no longer directly related to HF SM when patient activation variable was tested simultaneously ($\beta = 0.895$, $P = 0.098$), indicating full mediation (Table 3).

4. Discussion

The study findings support the hypothesis that patient activation mediates the effect of self-efficacy on SM in HF patients discharged from rural critical access hospitals. The results suggest: (1) there are significant intercorrelations between self-efficacy, patient activation and SM in HF patients; (2) HF patients who report a higher level of confidence in SM are more likely to be “ready and willing” (activated) to engage in SM behaviors; (3) activated patients are more likely to practice SM (e.g., taking medication as prescribed, following daily fluid and sodium restrictions); and (4) self-efficacy contributes to the engagement of SM through its effect on patient activation.

Our findings are supported by multiple observational studies, reporting that both self-efficacy and activation have effects on SM (Bos-Touwen et al. 2015a, Peters-Klimm et al. 2013, Wolever et al. 2011, Cooper et al. 2011, Begum et al. 2011). However, the positive effect of self-efficacy on SM shown in the observational study was not present in the intervention studies aimed to promote SM behavior through efficacy-enhancing interventions (van Dijk-de Vries et al. 2015, Paradis et al. 2010). Our finding may help explain the inconsistent findings between observational and interventional studies. The results of our study suggest patient activation is a mediating variable between self-efficacy and SM. Thus an intervention designed to only boost patients’ confidence in SM without targeting activation may not improve SM behaviors. Self-efficacy (confidence) in SM is important, but may not be sufficient to achieve patients’ engagement in SM practice. The results from Shively’s randomized controlled trial aimed to improve patient activation in SM further supports our finding. Her study showed that an activation-enhancing intervention improved patients’ perceived control, SM adherence, reduced healthcare utilizations (i.e., ED visits and hospitalization) with the exception of no impact on self-efficacy in HF patients receiving care from the Veterans Affairs healthcare system (Shively et al. 2012).

A critical question raised by this and prior studies is how to “activate” a confident patient to engage in SM. Based on a recent review of the evidence assessing interventions to improve SM among patients living with multiple chronic conditions, besides the common strategies used in efficacy-enhancing interventions (e.g., removal of barriers and challenges to SM (Dattalo et al. 2012, Katz et al. 2012, Solomon et al. 2012, Deen. 2011) and building knowledge and skills of SM (Katz et al. 2012, Butler et al. 2012), establishment of long-term partnerships to support sustained SM (Dattalo et al. 2012, Katz et al. 2012, Alexander et al. 2012) and utilizing strategies to improve patients’ accountability in SM (Katz et al. 2012, Butler et al. 2012) are key ingredients to activate SM engagement. Overwhelming evidence indicates the quality of provider-patient interaction is an independent predictor of patient activation and SM behaviors in populations with various chronic illnesses (Dixon et al. 2009, Dattalo et al. 2012, Alexander et al. 2012, Wong et al. 2011, Alegria et al. 2009, Teh et al. 2009, Becker and Roblin. 2008). In an interventional study to promote chronic disease SM, Hibbard reported that participants from both intervention and control groups had improved

patient activation and SM practice which led to no statistically significant differences between the intervention and control groups(Hibbard et al. 2007). In fact, “for a few of the behaviors the control group showed greater gains in SM as compared with the intervention group over the course of the study”(Hibbard et al. 2007). It is speculated that the ongoing relationships between participants and research personnel might activate participants’ SM behaviors in the control group over the study period.

Our healthcare delivery system is transitioning from traditional fee-for-service (FFS) to a value based system in which the cost of care is directly linked to the quality of care (Stefanacci. 2011). The concept of value-based care can only be achieved within a patient-centered care model in which patients and healthcare providers establish ongoing partnership in co-managing the chronic conditions (Stefanacci. 2011). However, it is uncertain how the partnership can be established if confident patients with the capacity for SM do not actively engage in SM. Patient activation is a composite construct that conceptually integrates and reflects the broad range of elements needed for a person to manage a chronic illness (e.g., beliefs, attitudes, knowledge, skills, self-efficacy, perceived control and support, outcome expectation) (Hibbard et al. 2004, Dixon et al. 2009, Solomon et al. 2012). Therefore, strategies to enhance SM knowledge and self-efficacy are not adequate to activate a patient to engage in SM practice. Sustained patient-provider partnership and patient/family accountability in SM are the key elements to “activate” patients’ SM practice, which often is not addressed enough in efficacy-enhancing interventions.

4.1. Limitations

Several limitations exist in this study: 1) the use of convenience sampling affects the generalizability of the findings to other HF populations; 2) Participant recruitment may have resulted in selection bias. The original study was a randomized controlled trial aimed to improve SM adherence. It is possible that patients who enrolled in this study could be more confident and more actively engaged in SM behaviors than patients who declined. However, the relationships among self-efficacy, activation and SM should be consistent in both enrolled and unenrolled patient groups. Moreover, if we did enroll patients with higher levels of activation, then the bias could have hindered the detection of the significant relationships between the variables of interest due to the reduced amount of variance. We also compared our baseline outcomes with those reported in Shively’s heart PACT study. The mean levels of patient activation and SM adherence were lower than that in Shively’s study of HF patients(Shively et al. 2012); 3) Only baseline data were used. Therefore, the temporal relationships among studied variables over time were not analyzed and reported in this article. 4) Although the sample size met the minimal requirement to conduct path analysis, using a larger sample would increase the validity of the findings.

4.2. Implications for practice

Both patients’ confidence and activation levels in SM should be regularly assessed by clinicians over time to 1) monitor SM progress; and 2) help identify and implement tailored intervention strategies to improve SM engagement, leading to improved care and health outcomes. Furthermore, strategies to promote SM accountability and responsibility need to

be developed and implemented. For instance, one of the strategies is to provide incentives or deterrents to promote appropriate SM action (Stefanacci. 2011).

4.3. Implication for research

Future research needs to examine specific mechanisms of improving engagement in SM. In addition to strategies to improve patients' self-efficacy, activation-enhancing strategies (e.g., developing long-term partnership of SM and holding patient accountable for SM) are necessary for successful interventions aimed at promoting SM. Secondly, replications of the current investigation, using larger samples and more diverse populations, would help to illuminate the mediating effect of activation on self-efficacy and SM.

5. Conclusion

The evidence on efficacy of current mainstream interventions to improved engagement of SM is limited. Many of these interventions were designed to improve self-efficacy but fail to address other determinants of SM. The findings from this study demonstrate that patient activation accounted for the impact of self-efficacy on SM. This finding contributes to knowledge in understanding the impact of self-efficacy and patient activation on SM, which could inform the development of effective interventions to promote SM in the rural HF population. Future studies aimed to promote SM need strategies to enhance both self-efficacy and activation.

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Figure 1.
The relationship between self-efficacy, patient activation, HF self-management

Table 1

Demographical and clinical characteristics of participants (n = 101)

Variables	<i>M ± (SD or %)</i>
Age (mean in year ± standard deviation)	70 (± 12.16)
Male	37 (36.60%)
Years of school	12.92 (± 2.275)
Race: White	96 (95%)
Working outside home	29 (28.7%)
Annual household income below \$50,000	67
Marital Status	
Married or living with partner	51 (50.5%)
Medicare	79 (78.2%)
New York Heart Association Classification	
Class II	49 (48.5%)
Class III	43 (42.6%)
Ejection fraction	55.81% (± 11.12%)
BNP (pg/mL)	477.36 (±1493.70)
Charlson Comorbidity Index	4.40 (±2.31)
The number of prescription medications	12.13 (±6.09)
Total cholesterol	178.43 (±35.16)
HgbA1C	7.68 (±2.34)
Body Mass Index (BMI)	32.05 (±7.18)

TABLE 2
Descriptive statistics and Pearson’s correlations coefficients for the correlates (n = 101).

Correlates	Mean	Standard Deviation	Range	SeSM	PAM	HISM
Self-efficacy for SM (SeSM)	46.8	23.80	0–100	--	0.676**	0.391**
Patient activation measure (PAM)	57.02	18.71	0–100	--	--	0.324**
HF SM (HISM)	89.06	19.74	0–145	--	--	--

Note:
* p<0.05;
** p<0.01

Table 3

Unstandardized and standardized path coefficients, z values, and r^2 values for models (n = 101).

Paths	Unstd. B	Std. Errors	Z-test	Std. B	R ²
To patient activation from:					0.110
Self-efficacy for SM	2.078 **	0.556	3.738	0.331 **	
To HF SM from:					0.121
Patient activation	0.294 **	0.115	2.565	0.279 **	
Self-efficacy for SM	0.895	0.541	1.655	0.135	

Note.

* p<0.05;

** p<0.01,