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Original Article

Gender differences in self-care maintenance and its associations among patients with chronic heart failure

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ABSTRACT

Objectives: To identify the gender differences in self-care maintenance and its associations among chronic heart failure patients using the Information-Motivation-Behavioral Skills model.

Methods: Two hundred and ten patients (54.0% female) with chronic heart failure participated in this cross-sectional study. Self-care, knowledge of heart failure, social support and illness perception were measured using the Self-Care of Heart Failure Index, the questionnaire of heart failure knowledge, the Perceived Social Support Scale, and the Revised Illness Perception Questionnaire, respectively.

Results: Mean scores for self-care maintenance were 51.4 ± 14.8 in men and 55.6 ± 14.1 in women ($t = -2.066, P < 0.05$). Associated factors of self-care maintenance were social support and self-care confidence in men and the knowledge of heart failure, self-care management and self-care confidence in women. The relationship between social support and self-care maintenance was mediated by self-care confidence in men, whereas the relationship between knowledge of heart failure and self-care maintenance was mediated by self-care management and self-care confidence in women.

Conclusions: Self-care maintenance were inadequate in both genders with chronic heart failure. Interventions for enhancing social support and self-care confidence in men patients, and strengthening knowledge of heart failure, self-care management and self-care confidence in women patients, may facilitate self-care maintenance.

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1. Introduction

Chronic heart failure (CHF) affects approximately 26 million population worldwide [1]. Its prevalence in developed countries and China are 1%–2% [2] and 0.9% [3] respectively. Over one million people are hospitalized annually because of heart failure in both Europe and the US, and the one-year mortality of CHF was 17.4% in Europe [2], 31.4% in the US [4], and 16.5% in other regions [5]. Similarly, the mortality rate of CHF in China was 19.5% at one year [6]. Thus, facilitating the prognosis and survival of CHF patients is imperative.

Self-care maintenance refers to patients' treatment adherence and healthy behaviors (e.g., taking medicine as advised, eating a low-salt diet, and participating in exercise regularly) [7]. Self-care

maintenance has been demonstrated to diminish hospitalizations, mortality, and the living quality in CHF population [8]. However, an investigation in 15 countries found self-care maintenance was poor worldwide and differed among diverse patients from different continents and countries [9]. In Chinese patients, the self-care behavior was poor [10,11], and decreased significantly during a three-month follow-up period [11]. Therefore, improving self-care maintenance is indispensable to CHF patients.

The Information-Motivation-Behavioral Skills (IMB) model [12] is a theoretical framework of behavior change, including three elements: information, motivation, and behavioral skills. Information refers to knowledge of behavior. Motivation consists of social motivation (perceptions of social support to behaviors) and personal motivation (individual beliefs and behavioral intentions to target behaviors). Behavioral skills is composed of objective skills and self-efficacy for behaviors. The target behavior in the IMB model refers to the behavior requiring change. Although the IMB model is validated in patients with diabetes, coronary artery diseases, and cancers [13], it has rarely been used to test self-care maintenance in CHF patients. Using the IMB model for CHF [7,12],

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we considered knowledge of heart failure as information, social support as social motivation, illness perception as personal motivation, self-care management as objective skills, self-care confidence as self-efficacy, and self-care maintenance as behavior requiring change. The hypothetical IMB model for self-care maintenance of CHF patients is presented in Fig. 1.

In previous studies, patients with better knowledge of heart failure (e.g. reason of salt restriction, measurement of the body weight, appropriate physical exercise, and medication compliance) had better self-care behaviors and a higher level of quality of life [14,15]. Knowledge of heart failure was poor but positively contributed to self-care maintenance [15,16]. Other studies have demonstrated an indirect effect of knowledge on self-care maintenance or no link between them [10,17].

Social support is essential to self-care maintenance in CHF patients [8,18]. It has significant influence on self-care maintenance, and patients with more social support have been shown to perform better self-care maintenance [10,18]. Social support has also been significantly correlated to self-care maintenance during a three-month follow-up in CHF patients, and interventions addressing social support have been suggested to improve self-care maintenance [10,11]. Nonetheless, another study found social support was unrelated to self-care maintenance [16].

Illness perception refers to the subjective beliefs of patients regarding their illness. It has a positive relation to self-care confidence and self-care maintenance in CHF patients [19,20]. In a longitudinal study, illness perception declined during a six-month follow up, and improving illness perception was recommended as an important part of the tailored education on self-care maintenance [20]. Another study also reported illness perception should be emphasized and targeted interventions are needed to correct misconceptions and enhance self-care [19]. Since illness perception was modifiable with the development of the disease [20], which further addresses the necessity of illness perception for managing CHF.

Self-care management refers to patients' reactions to their symptoms, such as recognizing and evaluating a change, determining to adopt measures, performing a therapy and evaluating its effect [7]. The association of self-care management and self-care maintenance has rarely been reported [21]. Although knowledge of heart failure, social support, and illness perception were related to self-care maintenance [10,18,19], the mediating effects of self-care management between these factors and self-care maintenance remain unclear in CHF patients.

Self-care confidence refers to personal belief in self-care, which mediates or moderates the self-care process [7]. Self-care confidence is demonstrated to predict self-care maintenance independently [17], and only one study reported its mediation effect in the relationship between knowledge of heart failure and self-care maintenance and the relationship between social support and self-care maintenance [10].

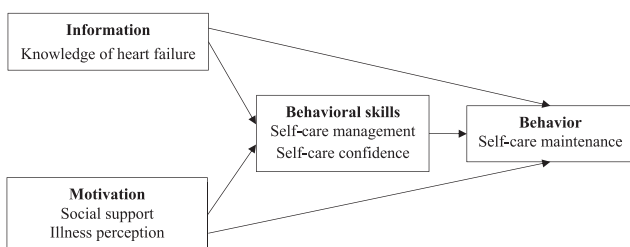


Fig. 1. The hypothetical Information-Motivation-Behavioral Skills model for self-care maintenance of chronic heart failure patients.

Gender differences in self-care maintenance have been indicated [17,22]. Men perform better self-care maintenance than women, and unmarried women and older men were more likely to perform sufficient self-care maintenance [22]. Better self-care maintenance was attributed to more knowledge of heart failure in men, whereas it was attributed to better self-care confidence and poorer functional status in women [16]. Nevertheless, a study reported that gender-specific factors (e.g., social support) affected self-care maintenance rather than gender itself [23]. Therefore, gender differences in self-care maintenance among CHF patients require further examination.

The aim of this study was to assess associations of knowledge of heart failure, social support, illness perception, self-care management, self-care confidence with self-care maintenance by gender among patients with CHF using the IMB model.

2. Methods

2.1. Participants

This is a cross-sectional study. The investigation was guided by the Declaration of Helsinki and approved by the Nursing Ethics Committee of Shandong University. Two hundred and twenty-five patients with CHF were recruited from cardiovascular wards and signed a written informed consent in a teaching hospital in Shandong, China from February to October in 2014. Fifteen patients were excluded for missing some questions in the final analyses. The inclusion criteria were: (a) a confirmed diagnosis of CHF by cardiologist; (b) ≥ 18 years old; (c) absence of cognitive impairment (assessed by the Mini-Mental State Examination); and (d) ability to read or speak Chinese. The exclusion criteria were: (a) mental or cognitive impairment; and (b) serious or life-threatening disease (e.g., a malignancy or renal failure).

2.2. Measurements

2.2.1. Self-care of heart failure

The Self-Care of Heart Failure Index (SCHFI) was developed and modified by Reigel et al. [24]. A Chinese version of the SCHFI [25] with 22 items was used in this study. It consists of three sub-scales: self-care maintenance, self-care management, and self-care confidence. Items are scored on a four-point response format that ranges from 1 to 4, except for two items of self-care management (ranging from 0 to 4). The sub-scales were used separately, and scores for sub-scales were standardized to range from 0 to 100. A higher score indicates better self-care (scores ≥ 70 are considered “adequate” self-care). The Cronbach's α in this study was 0.784, and it ranged from 0.633 to 0.756 for the three sub-scales.

2.2.2. Knowledge of heart failure

This questionnaire was compiled by the investigators based on relevant literature [10,14–17]. Three heart failure experts validated its content and face validity. And a pilot test was carried out in 10 patients with CHF. The questionnaire was revised based on feedback. It includes 10 items focusing on cause of heart failure (e.g., “Heart failure was caused by the heart failing to pump blood properly”), symptoms of heart failure (e.g., “Dyspnea is one of the symptoms of heart failure”, “A worse fatigue indicates the deterioration of the heart failure”), and importance of adherence to taking daily weights, a low-sodium diet, physical exercises, and taking medications to heart failure patients (e.g., Taking daily weight is important to heart failure patients). Each correct answer scored 1 point, and wrong answers and “I don't know” scored 0 point; the total score ranged from 0 to 10 points.

2.2.3. Social support

A Chinese version of the Multidimensional Scale of Perceived Social Support (MSPSS) [26] was used to survey the social support patients perceived from others. This 12-item scale is composed of three dimensions, including family support, friends support and significant others support. Response categories are based on a seven-point scale ranging from 1 point to 7 points. A higher score indicates a higher level of social support. The Cronbach's α was 0.845 in this study.

2.2.4. Illness perception

The Revised Illness Perception Questionnaire (IPQ-R) was simplified by Moss-Morris et al. [27]. And a Chinese version of the IPQ-R (<https://www.uib.no/ipq/>) was used to assess the disease condition awareness of patients. This 38-item scale consists of time line acute/chronic, time line cyclical, consequences, personal control, treatment control, illness coherence, and emotional representations. Response categories are rated on a five-point scale ranging from 1 point to 5 points. The scores for personal control and treatment control were reversed. A higher score indicates a worse and negative perception on the illness. The Cronbach's α was 0.804 in this study.

2.2.5. Cognitive competence

A Chinese version of the Mini-Mental State Examination (MMSE) [28,29] was used in this study. This 30-item scale provides a brief evaluation of the orientation of time, place, immediate memory, short-term memory, calculation, verbal expression, naming and repeating, reading and understanding, and graphical depiction. Each correct answer scored 1 point. The cutoff points for severe cognitive impairment of illiteracy, primary school and middle-school or above were less than 17 points, 20 points and 24 points, respectively.

2.2.6. Demographic and clinical characteristics

The data for gender, age, place of residence, marital status, job category, educational level, and monthly income of the patients, and New York Heart Association (NYHA) functional class were gathered by medical review or patient interviews.

2.3. Statistical analyses

SPSS version 20.0 (IBM Corp, Armonk, NY) was employed for

data analyses. Descriptive statistics, including means and standard deviations or frequencies and percentages were used to summarize the variables by gender, and t-tests or chi-square tests were used to analyze the gender differences. A one-way ANOVA or t-test were performed to explore the gender differences in self-care maintenance by demographic and clinical characteristics. Pearson's correlation was performed to examine the correlations among the variables. Multiple linear regression analyses were performed to identify the associations of self-care maintenance by gender.

Baron and Kenny's method [30] was used to examine the mediation effects of self-care management and self-care confidence. The presumed mediators must meet the following criteria: (a) independent variables are significantly related to the dependent variable without mediators; (b) independent variables are significantly related to mediators; (c) mediators are significantly related to the dependent variable; and (d) significant associations between independent variables and the dependent variable are less significant (partial mediation) or no longer significant (full mediation) when adjusted for mediators. A series of linear regressions were performed based on the steps of Baron and Kenny. In the first step, the association between independent variables (knowledge of heart failure, social support, and illness perception) and dependent variable (self-care maintenance) was tested. In the second step, the associations between knowledge of heart failure, social support, and illness perception and potential mediators (self-care management or self-care confidence) were tested. In the third step, the association between self-care management or self-care confidence and self-care maintenance was tested. In the fourth step, both independent variables and potential mediators were entered as predictors of self-care maintenance. All multiple analyses were adjusted for the covariates in which significant differences were found in the aforementioned One-Way ANOVA or t-test. A $P < 0.05$ was considered statistical significant.

3. Results

3.1. Sample characteristics and construct variables

A total of 210 participants with CHF entered in the final analyses. As shown in Table 1, the participants (54.0% female) aged from 27 to 85 years with a mean age of 62.3 ± 12.8 years. Most participants were married (82.4%), had a monthly income less than ¥3000 (approximately \$450) (71.9%) and had NYHA class II/III (84.8%).

Table 1
Sample characteristics and construct variables in patients with chronic heart failure [Mean \pm SD or n(%)].

Variables	Total (n = 210)	Men (n = 96)	Women (n = 114)	χ^2/t
Age (years)	62.3 \pm 12.8	62.4 \pm 12.5	62.2 \pm 13.1	0.082
Residence (urban)	133 (63.3)	68 (70.8)	65 (57.0)	4.284*
Marital status (married)	173 (82.4)	86 (89.6)	87 (76.3)	6.320*
Job (employed)	121 (57.6)	53 (55.2)	68 (59.6)	0.421
Education (\geq high school)	126 (60.0)	72 (75.0)	54 (47.4)	16.579**
Monthly income (\geq ¥3000) ^a	59 (28.1)	32 (33.3)	27 (23.7)	2.402
NYHA				3.217
Class II	102 (48.6)	53 (55.2)	49 (43.0)	
Class III	76 (36.2)	31 (32.3)	45 (39.5)	
Class IV	32 (15.2)	12 (12.5)	20 (17.5)	
Self-care maintenance	53.7 \pm 14.5	51.4 \pm 14.8	55.6 \pm 14.1	-2.066*
Self-care management	57.1 \pm 12.4	58.3 \pm 11.4	56.0 \pm 13.2	1.351
Self-care confidence	56.6 \pm 15.2	58.4 \pm 14.9	55.0 \pm 15.3	1.610
Knowledge of heart failure	6.9 \pm 1.4	6.9 \pm 1.3	6.9 \pm 1.5	0.265
Social support	64.8 \pm 6.2	65.7 \pm 6.1	64.0 \pm 6.1	2.005*
Illness perception	117.6 \pm 12.1	117.3 \pm 12.2	117.8 \pm 12.1	-0.336

Note: M, Mean; SD, standard deviation; NYHA, New York Heart Association.

* $P < 0.05$; ** $P < 0.01$.

^a ¥3000 = approximately \$450.

Table 2
Correlations of construct variables in patients with chronic heart failure.

Variables	1	2	3	4	5	6
Men (n = 96)						
1.Self-care maintenance	1					
2.Self-care management	0.322**	1				
3.Self-care confidence	0.467**	0.422**	1			
4.Knowledge of heart failure	0.323**	0.105	0.186	1		
5.Social support	0.366**	0.418**	0.458**	0.222*	1	
6.Illness perception	0.006	0.015	-0.161	0.191	-0.92	1
Women (n = 114)						
1.Self-care maintenance	1					
2.Self-care management	0.516**	1				
3.Self-care confidence	0.477**	0.519**	1			
4.Knowledge of heart failure	0.444**	0.508**	0.360**	1		
5.Social support	0.166	0.262**	0.248**	0.328**	1	
6.Illness perception	-0.184*	0.059	-0.097	0.061	0.125	1

Note: ** $P < 0.01$; * $P < 0.05$.

Table 3
Associations of self-care maintenance by gender in patients with chronic heart failure.

Variables	Beta	SE	β	t	Tolerance	VIF
Men (n = 96)						
Self-care confidence	0.512	0.097	0.515	5.297**	0.567	1.765
Age (years)	0.362	0.119	0.306	3.039**	0.528	1.892
Residence (urban)	7.648	3.050	0.237	2.508*	0.602	1.660
Job (unemployed)	7.704	3.120	0.261	2.470*	0.481	2.080
Women (n = 114)						
Self-care management	0.315	0.097	0.294	3.257**	0.681	1.468
Self-care confidence	0.195	0.076	0.211	2.564**	0.565	1.771
Age (years)	0.315	0.094	0.292	3.341**	0.603	1.660
Monthly income (\geq ¥3000) ^a	6.205	2.616	0.187	2.372*	0.740	1.351

Note: SE, standard error; β , standardized beta; VIF, variance inflation factor.

Men, adjusted $R^2 = 0.491$, $F = 10.153$, $P < 0.01$; women, adjusted $R^2 = 0.479$, $F = 11.370$, $P < 0.01$.

** $P < 0.01$; * $P < 0.05$.

^a ¥3000 = approximately \$450.

Significant gender differences existed in residence, marital status, and education levels. The proportions of participants who were married, living in urban areas and had a high school and higher education were larger in men (89.6%, 70.8% and 75.0%, respectively) than in women (76.3%, 57.0% and 47.4%, respectively).

The mean scores for self-care maintenance were 51.4 ± 14.8 in men and 55.6 ± 14.1 in women (Table 1). Men had a lower score for self-care maintenance than women ($t = -2.066$, $P < 0.05$). Score for social support in men were higher than in women ($t = 2.005$, $P < 0.05$).

3.2. Self-care maintenance based on demographic and clinical characteristics

Patients who lived in urban areas, were unemployed and high school or higher educated, and had a monthly income more than ¥3000 scored higher for self-care maintenance than patients who resided in rural areas, were employed and less than high school educated, and had a monthly income less than ¥3000 in both men and women (all $P < 0.05$). Furthermore, female patients older than 65 years scored higher for self-care maintenance than those younger than 65 years ($P < 0.01$).

3.3. Correlations of construct variables

The correlation coefficients of construct variables by gender were shown in Table 2. In men, scores for knowledge of heart failure, social support, self-care management, and self-care confidence were positively correlated with the score for self-care

maintenance (all $P < 0.01$). In women, scores for knowledge of heart failure, self-care management, and self-care confidence were positively correlated with the score for self-care maintenance (all $P < 0.01$). The score for illness perception was negatively correlated with the score for self-care maintenance ($P < 0.05$).

3.4. Associations of self-care maintenance

As Table 3 presented, the score for self-care confidence ($\beta = 0.515$, $P < 0.01$) was positively contributed to the score for self-care maintenance in men after controlling the covariates. Self-care confidence, age, residence and job accounted for 49.1% of the variance. In women, scores for self-care management ($\beta = 0.294$, $P < 0.01$) and self-care confidence ($\beta = 0.211$, $P < 0.05$) were positively contributed to the score for self-care maintenance when adjusted for the covariates. Self-care management, self-care confidence, age and monthly income explained 47.9% of the variance.

3.5. Mediating roles of self-care management and self-care confidence

The association between social support and self-care maintenance was fully mediated by self-care confidence in men (Fig. 2A). The β value for the association between social support and self-care maintenance without self-care confidence was 0.270 ($P < 0.01$); after including self-care confidence, it was 0.075 ($P > 0.05$). The association between knowledge of heart failure and self-care maintenance was fully mediated by self-care management and partly mediated by self-care confidence in women (Fig. 2B). The β

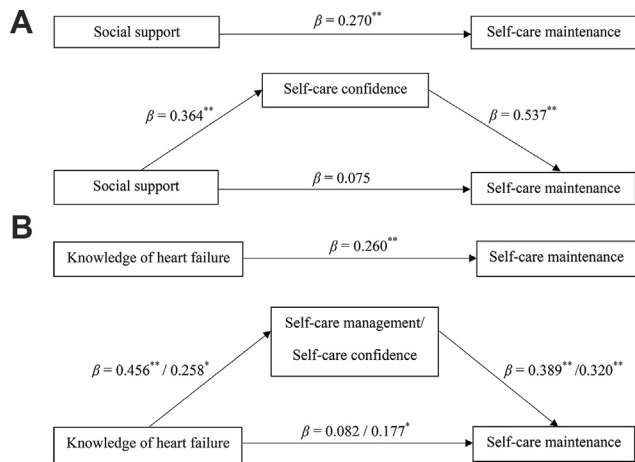


Fig. 2. A. Mediating role of self-care confidence in the association between social support and self-care maintenance in **men** with chronic heart failure.

β = standardized coefficient ($^*P < 0.05$; $^{**}P < 0.01$).

B. Mediating roles of self-care management and self-care confidence in the association between social support and self-care maintenance in **women** with chronic heart failure.

β = standardized coefficient ($^{**}P < 0.01$; $^*P < 0.05$).

value for the association between knowledge of heart failure and self-care maintenance without self-care management and self-care confidence was 0.260 ($P < 0.01$); when self-care management or self-care confidence was included, it was 0.082 ($P > 0.05$) or 0.177 ($P < 0.05$), respectively.

4. Discussion

This study demonstrates the gender differences in self-care maintenance among CHF patients. Self-care maintenance was poor overall, and slightly better in women. The associations of self-care maintenance were social support and self-care confidence in men, whereas they were knowledge of heart failure, self-care management and self-care confidence in women. Social support influenced self-care maintenance through self-care confidence in men, whereas knowledge of heart failure influenced self-care maintenance through self-care management and self-care confidence in women.

4.1. Self-care maintenance

Self-care maintenance in both genders were inadequate. The levels of self-care maintenance in both genders were lower than those in previous studies [16,22]. This reminds us that self-care maintenance should be further emphasized in CHF patients. Women performed superior self-care maintenance than men in this study, which is the opposite of a prior study [22]. Men perceived more social support than women in this sample, which may impede the self-care of men because they tend to depend on others rather than on themselves when coping with CHF [23]. Furthermore, women were reported to have a greater symptom burden in a previous study; thus, they learned to cope with the symptoms and developed proper self-care maintenance [31].

4.2. Information and self-care maintenance

In this study, knowledge of heart failure affected self-care maintenance through self-care management and self-care confidence in women. This differs from a previous study that reported knowledge of heart failure was contributed to self-care

maintenance in men [16]. Other studies using a sample of both genders found heart failure knowledge was relate to self-care maintenance [10,15]. These differences may be due to the diversity of participants and the measurements. To some degree, these studies have supported the positive effect of heart failure knowledge on self-care maintenance in CHF population. However, the overall knowledge of heart failure was poor [15]. Educational interventions to target heart failure knowledge should be promoted to improve heart failure knowledge and its self-care.

4.3. Motivation and self-care maintenance

Men received more social support than women in this study. This is conformed to a prior finding that women received less social support for self-care [32]. The findings concerning the effect of social support on self-care maintenance are mixed. In some studies, social support was a positive association of self-care maintenance [10,18,23], whereas another study reported no connection between them [16]. In this study, social support affected self-care maintenance via self-confidence in men, whereas this relationship was not found in women. Similarly, women more frequently reported having no reliable person to talk to or help with their daily life, whereas men reported perceiving more support from their family members who assisted with their self-care [32]. Although the structure of social support and its impact on self-care differed according to gender, it was still considered extremely important in the self-care process [23]. Interventions addressing social support for CHF patients are necessary.

In this study, illness perception had no impact on self-care maintenance in men or women, although it was slightly correlated with self-care maintenance in women. This is different from previous studies that reported the effects of illness perception on self-care [19,20]. One reason for the inconsistent may be the culture difference between Chinese and British. The variations have also been supported by a prior study, which explored beliefs, values, and expectancy of end-of-life in Chinese female who reside in Britain [33]. In addition, a previous study highlighted the importance of illness perception in patients with chronic diseases and reported that it was negatively associated with the activation of self-care [34]. Thus, further study is necessary on this connection in CHF patients.

4.4. Behavioral skills and self-care maintenance

Self-care management was inadequate in both men and women, consistent with a prior study [22]. Impact of self-care management on self-care maintenance has rarely been tested in CHF patients. A study in heart failure caregivers found that caregiver contribution to self-care maintenance affected the caregiver contribution to self-care management [21]. In this study, self-care management positively affected self-care maintenance and fully mediated the relationship between knowledge of heart failure and self-care maintenance in women, suggesting that targeted interventions focused on self-care management may improve self-care maintenance.

Self-care confidence was an association of self-care maintenance in both genders in this study. Previously, self-care confidence was reported as a facilitator of self-care maintenance in men and positively related to self-care maintenance in women [16,23]. The findings from these studies agree with this study. In addition, we found gender differences in the mediation effects of self-care confidence on relationships between social support, knowledge of heart failure and self-care maintenance. Previous studies support the mediation effects of self-care confidence [10,35]. It indicates that boosting self-care confidence may improve self-care

maintenance, and enhancing heart failure knowledge may also be beneficial to self-care maintenance via self-care confidence in patients with CHF.

4.5. Other associations of self-care maintenance

In this study, age was a positive association of self-care maintenance in both genders, which is consistent with previous studies [10,16,22,33]. We also found that being unemployed and living in urban areas were positive associations of self-care maintenance in men. Employed patients have less spare time [36] and better socioeconomic resources and health care access in urban areas [37] may explain the finding. A monthly income more than ¥3000 was a positive association of self-care maintenance in women, which is similar to a prior study [38].

4.6. Limitations

There are three limitations in this study. First, causation cannot be inferred because of the cross-sectional design, and longitudinal, predictive designs are necessary to identify the trajectory of self-care maintenance. Second, participants with CHF were recruited from cardiovascular departments in only one hospital, which might limit the generalizability of this study; thus, more diversified samples are necessary to represent the target population. Third, self-reported bias cannot be avoided although the reliability and validity of the measurements were acceptable.

5. Conclusions

In conclusion, although self-care maintenance was better in women than in men, some efforts must be made to facilitate self-care maintenance in both genders with CHF since they both perform insufficient self-care maintenance. The associations of self-care maintenance differed by gender; thus, targeted interventions to enhance social support and self-care confidence may improve self-care maintenance in men, and interventions to strengthen knowledge of heart failure, self-care management and self-care confidence may improve self-care maintenance in women.

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Ethical approval

The Nursing Ethics Committee in Shandong University approved this study.

Conflicts of interest

The authors declare no conflicting of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2018.11.008>.

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