Gender Differences in Heart Failure Self-Care: A Multinational Cross-Sectional Study

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Abstract

Background—Despite a common view that women are better at self-care, there is very little evidence to support or challenge this perspective in the heart failure (HF) population.

Objective—The purpose of this study was to determine if there are cross-cultural gender differences in self-reported HF self-care and to describe gender differences in the determinants of HF self-care.

Design, Setting, and Participants—A secondary analysis was completed of cross-sectional study data collected on 2,082 adults with chronic HF from the United States, Australia and Thailand.

Methods—Comparisons were made between men and women regarding self-care maintenance, management and confidence as assessed by the Self-Care of Heart Failure Index, as well as the proportion of subjects engaged in adequate self-care. Multivariate comparisons were made to determine if gender explained sufficient variance in HF self-care and the likelihood of reporting adequate self-care, controlling for nine model covariates.

Results—The sample was comprised of 1,306 men and 776 women. Most (73.5%) had systolic or mixed systolic and diastolic HF and 45% had New York Heart Association class III or IV HF. Although small and clinically insignificant gender differences were found in self-care maintenance, gender was not a determinant of any aspect of HF self-care in multivariate models. Married women were 37% less likely to report adequate self-care maintenance than unmarried women. Comorbidities only influenced the HF self-care of men. Being newly diagnosed with HF also primarily affected men. Patients with diastolic HF (predominantly women) had poorer self-care maintenance and less confidence in self-care.

Conclusion—Differences in HF self-care are attributable to factors other than gender; however, there are several gender-specific determinants of HF self-care that help identify patients at risk for practicing poor self-care.

What is already known about the topic?

- There are few gender differences in single aspects of heart failure self-care when measured subjectively and in small samples of heart failure patients.
- The influence of gender on heart failure symptom recognition and treatment, and confidence in self-care skills are largely unknown.
- Factors associated with heart failure self-care have been identified, but only in one aspect of self-care.

What this paper adds?

- The results of this study provide evidence that in a large and diverse multinational sample there are no clinically relevant gender differences in any of the three aspects of self-reported heart failure self-care.
- There are several gender-specific determinants of heart failure self-care that help identify patients at risk for practicing poor self-care.

Introduction

Patients with chronic heart failure (HF) are responsible for the majority of their own care. Thus, it is assumed that effective self-care is central to improving health outcomes in the HF population (Riegel & Dickson, 2008; Rockwell & Riegel, 2001). There is a contemporary and growing body of evidence to support this supposition. Based on systematic reviews, interventions designed to enhance HF self-care practices reduce rates of HF and all-cause re-hospitalization (McAlister, Stewart, Ferrua, & McMurray, 2004; Jovicic, Holroyd-Leduc & Straus, 2006). More recent evidence suggests that patients who are more engaged in HF self-care have better 180-day economic outcomes (Lee, Carlson, & Riegel, 2007) and a have a lower composite risk of one-year mortality or hospitalization (Lee, Moser, Lennie, & Riegel, 2008).

A common belief is that women take better care of themselves than men (Senay et al., 2004). In HF, there is surprisingly little evidence to support or refute this belief. That is, inferences that can be drawn about gender differences in HF self-care behaviors are often lost in conceptual ambiguity, methodological limitations, and differences in measurement. For similar reasons,

little is known about gender-specific determinants of HF self-care. While cultural differences in HF self-care have been identified (Riegel et al., In Press), it remains unclear if cross-cultural gender differences in self-care exist. If there are gender differences in HF self-care and/or gender-specific determinants of HF self-care can be identified, groups of patients at risk for suffering the consequences of poor self-care can become the target of critical interventions that enhance and support effective self-care. Accordingly, the purpose of this study was to determine if there are cross-cultural differences in self-reported self-care between men and women, and to describe gender differences in the determinants of self-care in a large multinational sample of patients with HF.

Background

The Riegel model of HF self-care provided the theoretical framework for the current study (Riegel et al., 2004). HF self-care was defined as a naturalistic decision-making process involving; a) critical behaviors that help maintain physiologic homeostasis and prevent acute HF exacerbations (*self-care maintenance*), and b) actions taken to evaluate and effectively alleviate symptoms when they occur (*self-care management*) (Riegel et al., 2004; Riegel & Dickson, 2008). Confidence in the ability to perform HF self-care (*self-care confidence*) also was theorized to be important (Riegel et al., 2004). In this study, we were interested in evaluating gender differences in each of these three aspects of HF self-care, as collectively they are informative about the process of HF self-care.

The results of several previous cross-sectional studies have provided evidence that there are no gender differences in certain aspects of self-reported HF self-care. For example, Artinian, Magnan, Sloan, & Lang (2002) found no gender difference in HF self-care as measured by the Revised Heart Failure Self-Care Behavior Scale in a sample of 110 HF patients. The Revised Heart Failure Self-Care Behavior Scale, however, captures primarily self-care maintenance behaviors and not self-care management or confidence in self-care. Jurgens, Fain, & Riegel (2006) found no gender differences in subjective symptom recognition as measured by the Heart Failure Symptom Awareness Scale in a sample of 201 HF patients; but, this scale was designed exclusively to measure one small aspect of self-care management, symptom recognition. Ni et al., (1999) found no gender differences in a broad range of self-reported self-care maintenance behaviors in a sample of 113 HF patients; however, they did not measure self-care management or self-care confidence. Rockwell & Riegel (2001) found no gender differences in HF self-care as assessed by one scale on the Self-Management of Heart Failure Instrument in a sample of 209 HF patients. The scale used in this study only evaluated patients' ability to evaluate the importance of HF symptoms. Additionally, Heo, Moser, Lennie, Riegel, & Chung (2008) evaluated gender differences in the determinants of subjective self-care maintenance behaviors using the Self-Care of Heart Failure Index (SCHFI) in a sample of 122 HF patients. In that study, self-care maintenance and self-care confidence did not vary by gender. Better perceived control and knowledge, however, were determinants of self-care maintenance in men and better confidence in self-care and greater functional limitations were determinants of self-care maintenance in women. Gender differences in the determinants of self-care management and self-care confidence, however, were not evaluated.

In a retrospective descriptive study of 124 HF patients, Eastwood, Travis, Morgenstern & Donaho (2007) found no gender difference in the proportion of patients engaged in the self-care maintenance behaviors of daily weight monitoring and symptom monitoring. Holst, Willenheimer, Martensson, Lindholm & Stromberg (2006) found no differences in HF self-care maintenance as assessed by the European Heart Failure Self-care Behaviour Scale (EHFScBS) in a sub-sample of 60 HF patients enrolled in a larger trial. In this study, there was a trend favoring better adherence to daily weight control for women, but it did not reach statistical significance. Lupon et al. (2008) also evaluated HF self-care using the EHFSCBS,

and found no gender difference in a sample of 151 HF patients at enrollment in a 12-month educational intervention. In that study, men had more improvement in HF self-care than women in univariate analyses. Chriss, Sheposh, Carlson & Riegel (2004) measured self-care maintenance using the SCHFI at baseline and 3 months in a sample of 66 HF patients. In that study, male gender was a significant determinant of self-care maintenance at 3 months. But, like the rest of the studies included in this brief review, this study only measured one aspect of subjective self-care and in a small sample of HF patients.

To date, there have been no studies evaluating gender differences in all three aspects of HF self-care (maintenance, management, and confidence) in a large and multinational sample. Riegel et al. (In Press) have identified that self-care of chronic HF, especially self-care management, is generally poor across cultures and that a few key cultural differences in HF self-care are prominent. However, it remains unknown if there are cross-cultural differences in self-care attributable to gender. Thus, cross-cultural gender differences in HF self-care are the focus of this analysis.

Methods

This study involved a secondary analysis of cross-sectional study data collected on 2,082 adults with chronic HF. Data included in this analysis were collected during enrolment into six parent studies involving ethnically diverse HF populations conducted between 2002 and 2007. Data were from HF patients living in the U.S., Australia, and Thailand. All studies were approved by the local institutional review board overseeing research. Informed consent was obtained on all participants. Each study conformed to the principles outlined in the Declaration of Helsinki.

Sampling

Each parent study used similar inclusion and exclusion criteria. All study participants had a diagnosis of chronic HF (using New York Heart Association [NYHA] and/or Framingham classifications) confirmed using primarily echocardiography and all resided in a private residence where they were able to engage in HF self-care practices (Riegel et al., In Press).

United States—Two unique groups were enrolled from different regions of the United States. Self-identified Hispanics from near the U.S.-Mexico border of California were enrolled during a hospitalization at two participating community hospitals. This consecutive sample of 134 patients (primarily of Mexican origin) was enrolled into a randomized clinical trial testing a disease management intervention (Riegel, Carlson, Glaser & Romano, 2006). Only enrollment data obtained prior to randomization were included in the present analysis. A second ethnically-diverse U.S. sample of 453 was enrolled from out-patient HF clinics or during an acute hospitalization in one of four states in the Southeastern and Northeastern U.S. Patients in these primarily consecutive samples were excluded if they had a known cognitive deficit, a terminal illness, chronic renal failure requiring dialysis, or recent history of stroke or acute myocardial infarction.

Australia—Two samples of HF patients were enrolled from across five states in Australia. A total of 1,045 HF patients were recruited from 49 disease management programs across Australia. Each program enrolled at least 20 consecutive HF patients with a history of one or more prior hospital admissions for decompensated HF. All patients had a confirmed diagnosis of HF and aged >18 years. The second consecutive sample of 50 Australian patients was drawn from Melbourne, Australia. The Framingham criteria (Ho, Anderson, Kannel, Grossman & Levy, 1993) were used to include patients with chronic HF. Similar to the U.S. sample, potential patients were excluded if they had a history of cognitive impairment, cerebral vascular accident or transient ischemic attack, or dementia.

Thailand—Data on a total of 400 Thai HF patients collected during a previous study (Suwanno, Petpichetchian, Riegel & Issaramalai, 2009) were also included in this analysis. In that study, the causal relationships among the components of sociodemographics, illness characteristics, HF self-care, and overall health status were tested. HF patients who were able to communicate in the Thai language were enrolled from four randomly chosen tertiary care hospitals and two randomly chosen secondary care settings in southern Thailand. Participants had to have a confirmed diagnosis of chronic HF, have experienced clinical symptoms of HF in the prior four weeks, and be 18 years of age or older to be included in the parent study.

Measurement

In each study, we measured HF self-care subjectively with the SCHFI v.4 (Riegel et al., 2004). The 15 item SCHFI uses a 4-point Likert scale to compute three scales: self-care maintenance, management, and confidence. The five maintenance items assess treatment adherence behaviors and self-monitoring performed to prevent an acute exacerbation of HF (e.g., daily weighing). The six management items assess the ability to recognize symptoms when they occur, evaluate those symptoms, decide to implement self-care treatments and evaluate the effectiveness of the treatments implemented. The four items measuring confidence address the patient's perceived ability to engage in each phase of self-care management (e.g., recognize and treat symptoms). Scores on each of the subscales are standardized to 100; higher scores reflect better self-care. Coefficient alpha for the SCHFI scales ranged from .57 to .85 in a sample of 760 persons and construct validity also was demonstrated with confirmatory factor analysis (Riegel et al., 2004).

English, Spanish, and Thai versions of the SCHFI were used in the parent studies. The SCHFI was translated into Spanish and the Thai language and back translated into English in a process guided by the methods of Brislin (1980). Decentering and techniques of back translation were used to ensure culturally equivalent versions in Spanish and the Thai language. Items with discrepancies between the two language versions were modified and back translated again until translators agreed that the Spanish and Thai versions of the SCHFI conveyed the same meaning as the original SCHFI. In this multinational sample, coefficient alpha ranged from .608 (maintenance) to .883 (confidence), indicating better internal consistency of the SCHFI scales than in other samples (Riegel et al., 2004).

Statistical Analysis

Student's *t*-tests for equality of means without assuming equal variance were used to compare measures of self-care between men and women in the multinational sample and each sub-sample. Logistic regression models were used to calculate odds ratios (OR) and 95% confidence intervals (CI) in order to estimate the likelihood of reporting adequate self-care, using the cut-point of $\geq 70\%$ on each of the three SCHFI scales. Scores on each scale ≥ 70 are considered adequate, whereas scores below 70 are considered inadequate (Riegel & Dickson, 2008). A clinically meaningful difference in self-care was predefined as a change in one point on the SCHFI scale.

Linear regression modeling was used to assess the utility of gender in explaining variance in measures of self-care, and multiple linear regression modeling was used to control for the influence of several additional factors. Slope coefficients and standard errors or 95% CIs were used to estimate the direction of the relationship between gender and measures of self-care. Multiple logistic regression modeling was used to determine if gender was important in determining likelihood of reporting adequate self-care. To examine if determinants of HF self-care differ by gender, regression models were repeated separately for men and women as a final step.

Age in years was included in each model based on the work of Chriss, Sheposh, Carlson & Riegel (2004) who identified that older men were more likely to engage in HF self-care maintenance. Ni et al. (1999) observed that poor HF self-care maintenance was related to being unmarried; thus, marital status (married vs. unmarried) was included as a covariate. Rockwell & Riegel (2001) identified that higher education was associated with better HF self-care. Accordingly, the educational cut-off available (high school equivalent or greater vs. less than high school equivalent) was included in each model. Riegel & Carlson (2002) observed that having multiple comorbid conditions impaired effective self-care. Thus, Charlson comorbidity category (low, medium, or high) was included as a model covariate. Carlson, Riegel & Moser (2001) identified differences in symptom recognition in patients who were newly diagnosed with HF. Being newly diagnosed (≤2 months vs. >2 months) was therefore included in each model. Heo, Lennie, Moser, Riegel & Chung (2008) identified that poor functional status was associated with better HF self-care. NYHA functional class was included in each model for this reason. Potential gender differences in HF type and underlying etiology (Strömberg & Mårtensson, 2003) were also taken into account. Country sub-sample (U.S., Australia, and Thailand) also was included in each model.

Statistical significance was predetermined at $p < .05$. All analyses were performed using SPSS version 15.0 (Chicago, IL). With this sample of 2,082 patients, and assuming alpha = 0.05 and non-directional hypotheses, were able to detect a minimal effect size of 0.125 (Cohen's *d*) for *t*-tests, detect a minimal increase in R^2 of .008 with 10 model covariates, and detect minimal ORs of .88 or 1.14, and maintain statistical power of .80.

Results

Multinational sample characteristic are displayed in Table 1. The sample was comprised of older adults; 62.7% were male. About half of the sample was from Australia. Most of the sample had systolic or mixed HF, and most had been diagnosed with HF for longer than 2 months. Almost half were categorized as having a low comorbidity score. Two gender differences in patient characteristics were identified. First, a greater proportion of women than men had NYHA class III or IV HF, whereas a greater proportion of men than women had NYHA class I or II HF (χ^2=20.09, p<.001). Second, men tended to have systolic/mixed HF, while more women tended to have diastolic HF (χ^2=87.57, p<.001).

Overall, self-care maintenance scores were normally distributed around our cut point of adequacy with over half the sample reporting adequate self-care maintenance. Self-care management scores were low, with less than one-third of the sample reporting adequate self-care management. The average self-care confidence score was slightly below our cut point of adequacy, with less than half the sample reporting adequate levels of confidence in self-care. All aspects of HF self-care varied significantly by country (Table 2).

Gender Differences in Heart Failure Self-Care

Multinational Sample—Overall, men reported higher levels of HF self-care maintenance than women (Table 2). Men and women reported similar self-care management and confidence in self-care. Gender alone only explained 0.9% of the variance in self-care maintenance (F=17.275, p<.001), <0.1% of the variance in self-care management and 0.1% of the variance in self-care confidence (both p>.05) (Table 3). Women were 27% less likely than men to report adequate HF self-care maintenance. In contrast, women were equally likely as men to report adequate self-care management and adequate confidence in self-care (Table 3).

United States Sub-Sample—In the U.S. sample, men reported higher levels of self-care maintenance, and higher levels of self-care management than women (Table 2). Confidence in self-care was similar between men and women. Importantly, gender only explained 1.4%

of the variance in self-care maintenance (F=7.089, p=.008), 1.7% of the variance in self-care management (F=5.934, p=.015), and <1% of the variance in self-care confidence (p>.05). Women in the U.S. sample were 30% less likely than men to report adequate self-care maintenance (OR=.703, 95% CI=.500–.988, p=.042), but equally likely as men to report adequate self-care management and adequate confidence in self-care (both p>.05) (results not shown).

Australian Sub-Sample—In the Australian sample, men and women reported similar self-care maintenance, management and confidence (Table 2). Gender alone explained <1% of the variance in each aspect of HF self-care (all p>.05). Likewise, women in the Australian sample were equally likely as men to report adequate self-care maintenance, adequate self-care management, and adequate confidence in self-care (all p>.05) (results not shown).

Thailand Sub-Sample—In the Thai sample, men and women reported similar HF self-care maintenance and self-care management (Table 2). In contrast, men reported less confidence in self-care than women. Gender alone explained only 0.2% of the variance in self-care maintenance, 0.1% of the variance in self-care management, and 1% of the variance in self-care confidence (all p>.05). Women in the Thai sample were equally likely as men to report adequate self-care maintenance, adequate self-care management, and adequate confidence in self-care (all p>.05) (results not shown).

Determinants of Heart Failure Self-Care in a Multinational Sample of Men and Women

Gender was not a significant determinant of any aspect of HF self-care or likelihood of reporting adequate self-care in multivariate models (Table 3). There were, however, several factors other than gender that were significant determinants of at least one aspect of HF self-care. These significant factors included age, having a high school equivalent education or greater, Charlson comorbidity category, being recently diagnosed with HF, NYHA functional class, and HF type. Country also had a marked effect on each aspect of self-care confirming that HF self-care varied significantly by sub-sample even when the influence of other factors was controlled.

Gender-Specific Determinants of Heart Failure Self-Care in a Multinational Sample

Self-Care Maintenance—The model presented in Table 4 explained 19.7% of the variance in HF self-care maintenance in men (F=31.707, p<.001), and 29.6% of the variance in HF self-care maintenance in women (F=33.082, p<.001). Men who were newly diagnosed reported lower levels of self-care maintenance. Self-care maintenance varied significantly by country for women only. Men with a recent diagnosis were 27% less likely to report adequate self-care maintenance than men who had more experience with HF. Additionally, only older men had higher odds of reporting adequate self-care maintenance. For women, being married decreased the likelihood of reporting adequate self-care maintenance by 37%.

Self-Care Management—The model presented in Table 5 explained 18.5% of the variance in HF self-care management in men (F=24.273, p<.001), and 20.4% of the variance in HF self-care management in women (F=18.010, p<.001). The determinants of self-care management were similar for men and women. But, for men, having a higher comorbididy category increased the likelihood of reporting adequate self-care management, and men who were newly diagnosed were less likely to report adequate management. For women, having a high school equivalent education increased the odds of reporting adequate self-care management and having diastolic HF decreased the odds of reporting adequate self-care management.

Self-Care Confidence—The model presented in Table 6 explained 12.0% of the variance in HF self-care confidence in men (F=17.714, p<.001), and 17.3% of the variance in HF self-care confidence in women (F=16.521, p<.001). For men, being newly diagnosed with HF and

having more comorbidities decreased self-care confidence. Plus, having a high school equivalent education also was only a factor associated with better self-care confidence in men. Women with diastolic HF had lower confidence in self-care. Men with a high school equivalent education were more likely to report adequate self-care confidence, and those with more comorbidities and those who had higher NYHA function class were less likely to have adequate confidence in self-care. Women with diastolic HF were 24% less likely to report adequate confidence than women with systolic or mixed HF.

Discussion

In this large and diverse sample of patients with HF from three countries, gender did not explain a significant amount of variance in subjective measures of self-care or predict the likelihood of reporting adequate self-care in our multivariate models. Although there were two small gender differences in subjective self-care maintenance, neither difference was clinically relevant. First, the gender difference in self-care maintenance scores was less than a one point change on any individual maintenance scale item. Second, gender explained less than 1% of the variance in self-care maintenance in the univariate model. In sum, we conclude that there were no clinically relevant gender differences in any aspect of self-reported HF self-care in this sample.

Our results support the findings of Heo, Lennie, Moser, Riegel & Chung (2008) who also reported no significant gender difference in self-care maintenance and confidence using the SCHFI. Shuldham, Theaker, Jaarsma & Cowie (2007) and Holst, Willenheimer, Martensson, Lindholm & Stromberg (2006) also reported no difference in HF self-care maintenance using the EHFScBS. Our much larger and more heterogeneous sample and analysis of self-care management certainly add to these previous results. Combined, these data suggest that gender is not a strong determinant of any aspect of subjective HF self-care.

We also identified several common determinants of self-care for all patients with HF that may be useful in targeting groups for intervention. Similar to the previous work of Chriss, Sheposh, Carlson & Riegel (2004) and Heo, Lennie, Moser, Riegel & Chung (2008), we found that older HF patients (both men and women) reported being more engaged in self-care maintenance than younger samples. Confirming previous evidence (Rockwell & Riegel, 2001), higher education was associated with better self-care maintenance and self-care management in both men and women, although the positive influence of education was greater for women than men. Higher NYHA was associated with worse self-care maintenance and less confidence in HF self-care, confirming the work of Riegel and Carlson (2002) who indicated that physical limitations and debilitating symptoms impede effective self-care. A novel finding, however, was that older age was associated with worse self-care management (response to symptoms when they occur) for both men and women.

Several gender-specific determinants of HF self-care also were identified (Table 7). First, married women were 37% less likely than unmarried women to report adequate self-care maintenance. This result is different from previous research findings by Ni et al. (1999) who found that being unmarried was associated with worse subjective self-care maintenance behaviors. This may indicate that married women with HF are focused on other responsibilities, possibly including the care of others. It could also be that marital stress impedes adequate self-care maintenance for women. As a related example, Orth-Gomér et al. (2000) found that marital stress was associated with increased event-risk in women with coronary artery disease. It is plausible that marital stress also is keeping women from engaging adequately in maintenance aspects of HF self-care.

Second, comorbid conditions affected the self-care of men only, increasing the likelihood that men reported adequate self-care management, but at the same time decreasing confidence in self-care. Riegel & Carlson (2002) identified multiple comorbid conditions as a barrier to self-care. Perhaps men involved in self-care of several chronic illnesses are able to more easily recognize and manage HF symptoms when they occur. Patients managing multiple comorbid conditions often have to manage interactions between chronic illnesses and treatments thereof, as well as learn to master several sets of self-care skills (Bayliss, Seiner, Fernald, Crane & Main, 2003). Thus, they may be used to treating symptoms in general. Or, they may have no choice but to engage in self-care management behaviors due to persistent symptoms. For example, Rockwell & Riegel (2001) identified that HF patients who experienced more symptoms were more engaged in self-care. It is not clear why men do not feel confident in their abilities to manage HF symptoms when they occur.

Third, inexperience affected each aspect of self-care for men, but only self-care management for women. It has been identified previously that all HF patients find it difficult to recognize symptoms (Jurgens, 2006) and take appropriate action when they occur (Evangelista, Dracup, & Doering, 2000). Also, Dickson, Deatrick & Riegel (2008) explained how the development of skills in self-care comes with experience. Thus, it is not surprising to learn that both men and women who are inexperienced find symptom recognition and treatment more difficult. Further, it has been identified that there are differences in the way men and women make decisions (Sanz de Acedo Lizarraga, Sanz de Acedo Baquedano & Cardelle-Elawar, 2007). Perhaps the development of expertise in each aspect of HF self-care occurs on separate trajectories for women and men, and the importance men and women place on decision-making in response to symptoms when they occur differ. This is particularly difficult to assess given that these are cross-sectional data.

Fourth, men and women with diastolic HF had poorer self-care maintenance, but having diastolic HF decreased confidence in self-care for women only. More women than men in this sample had diastolic HF. Gary (2006) indicated that women with diastolic HF weigh themselves infrequently and do not maintain dietary sodium restrictions. Moreover, patients with diastolic HF may experience different symptoms such as fatigue (Gary), and may require different treatment strategies like controlling blood pressure (Aurigemma & Gaasch, 2004). Particularly as reducing activity level is the most common symptom amelioration strategy in women with diastolic HF (Gary), it is not surprising that they are less confident in managing HF symptoms. Information patients with diastolic HF receive from providers with regard to maintenance behaviors and symptom amelioration also may be insufficient.

At best, our model explained 30% of the variance in HF self-care. Thus, it is likely that there are yet to be identified determinants of HF self-care. Based on the results of this study, however, gender-specific interventions that aim to improve subjective HF self-care may not be warranted. On the contrary, there are several sub-groups of patients identified in this study that are at risk for engaging in poor self-care practices and suffering the consequences thereof. Specifically, these high risk groups included married women and women with diastolic HF, and men with multiple comorbid conditions or those who are newly diagnosed.

Strengths and Limitations

A limitation is that this is a secondary analysis of merged data collected during multiple clinical studies conducted around the globe. This limitation, however, is only minor as the sub-samples had similar inclusion and exclusion criteria, our measure of self-care had adequate internal consistency and was translated using a rigorous process to ensure that the three versions conveyed the same meaning, and our conclusions center around gender alone, and not cultural, ethnic, or regional differences in self-care. As this was an analysis of cross sectional data, no

inferences can be made with regard to the influence of gender on changes in HF self-care over time. Strengths of this study include our conceptualization and measurement of three distinct aspects of heart failure self-care and our inclusion of important confounders to avoid misspecification of multivariate models.

Conclusion

In our analysis of over 2,000 patients from three countries, we found no relevant gender differences in subjective HF self-care. Therefore, cross-cultural differences in the self-care of patients with HF are more likely due to factors other than gender. Moreover, there are several differences in the determinants of self-care by gender. These differences allow for the identification of patients at risk for practicing poor self-care.

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Table 1

Sample Characteristics by Gender

	Sample Total M ± SD or n(%)	Men M ± SD or n(%)	Women M ± SD or n(%)
n	2,082	1,306	776
Age	66.66 ± 13.32	66.31 ± 12.91	67.26 ± 13.98
Married	1,285(63.8%)	871(43.2%)	414(20.6%)
≥HS Education	1,343(64.6%)	899(43.3%)	444(21.4%)
Country:			
United States	587(28.2%)	363(61.8%)	224(38.2%)
Australia	1,095(52.6%)	735(67.1%)	360(32.9%)
Thailand	400(19.2%)	208(52.0%)	192(48.0%)
HF Type:			
Systolic or Mixed	1,479(73.5%)	1,015(50.4%)	464(23.1%)
Diastolic	226(11.2%)	92(4.6%)	134(6.7%)
Unsure	307(15.3%)	156(7.8%)	151(7.5%)
HF Etiology:			
Ischemic	969(47.0%)	664(32.2%)	305(14.8%)
Hypertensive	188(9.1%)	99(4.8%)	89(4.3%)
Other	904(43.9%)	533(25.9%)	471(18.1%)
Charlson Comorbid Category:			
Low (1–2)	988(47.6%)	601(28.9%)	387(18.7%)
Medium (3–4)	672(32.4%)	433(20.9%)	239(11.5%)
High (5 or more)	413(19.9%)	265(12.8%)	148(7.1%)
NYHA class:			
Class I	385(18.6%)	267(12.9%)	118(5.7%)
Class II	755(36.5%)	489(23.5%)	269(13.0%)
Class III	641(31.0%)	389(18.8%)	252(12.2%)
Class IV	287(13.9%)	134(7.4%)	134(6.5%)
New HF Diagnosis	418(20.2%)	275(13.3%)	143(6.9%)
Heart Failure Self-Care:			
SCHFI Maintenance (n=2,065)	70.24± 17.69	71.56 ± 16.99	68.03 ± 18.62
SCHFI Management (n=1,767)	55.36± 20.93	55.80 ± 20.94	54.66 ± 20.91
SCHFI Confidence (n=2,079)	66.56± 0.63	67.11 ± 20.18	65.64 ± 21.35
Adeq. Maintenance (n=2,065)	1,174(56.9%)	773(37.4%)	401(19.4%)
Adeq. Management (n=1,767)	496(28.1%)	331(17.6%)	185(10.5%)
Adeq. Confidence (n=2,079)	941(45.3%)	610(29.3%)	331(15.9%)

Note: Adeq. = adequate, HF = heart failure, HS = high school, M = mean, NYHA = New York Heart Association, SCHFI = Self-Care of Heart Failure Index, SD = standard deviation.

Table 2
Gender Differences in Heart Failure Self-Care by Sample

	Men Mean±SD	Women Mean±SD	*t*	*p*
Multinational Sample				
Self-Care Maintenance	71.54±16.97	68.03±18.62	4.290	<.001
Self-Care Management	55.80±20.94	54.66±20.91	1.122	.262
Self-Care Confidence	67.11±20.18	65.65±21.35	1.542	.123
U**.S. Sub-Sample**				
Self-Care Maintenance	66.84±15.99	62.81±17.53	2.778	.006
Self-Care Management	67.25±18.33	63.10±19.22	2.205	.028
Self-Care Confidence	71.82±16.05	71.11±18.06	.481	.631
Australian Sub-Sample				
Self-Care Maintenance	78.18±14.21	78.23±14.14	−.055	.956
Self-Care Management	56.66±20.19	58.11±20.28	−1.045	.296
Self-Care Confidence	70.40±18.82	69.81±18.89	.484	.629
Thailand Sub-Sample				
Self-Care Maintenance	56.44±15.03	55.13±16.62	.860	.409
Self-Care Management	40.12±15.91	41.24±16.75	−.689	.491
Self-Care Confidence	47.27±19.66	51.50±22.98	−1.972	.049

Note: Self-Care scores represent the self-care maintenance, self-care management, and self-care confidence scales of the Self-Care of Heart Failure Index. All self-care scales also varied significantly by country (all $p<.0001$). *t* = two-tailed *t*-test for equality of means without assuming equal variance. SD = standard deviation.

Table 3

Determinants of Heart Failure Self-Care and Likelihood of Adequate Self-Care in Men and Women with Heart Failure

	Linear Regression			Logistic Regression		
Variable	**Maintenance β (±SE)**	**Management β (±SE)**	**Confidence β (±SE)**	**Adequate Maintenance OR (95%CI)**	**Adequate Management OR (95%CI)**	**Adequate Confidence OR (95%CI)**
Gender Only	*−3.518 (±.801)***	*−1.145 (±1.021)*^{ns}	*−1.463 (±.936)*^{ns}	*.734 (.62–.88)**	*.911 (.74–1.13)*^{ns}	*.851 (.71–1.02)*^{ns}
Model Fit	R^2=.009^{ns}	R^2<.001^{ns}	R^2=.001^{ns}	χ^2=11.383*	χ^2=.728^{ns}	χ^2=3.109^{ns}
Age	.174 (±.027)**	−.153 (±.037)**	−.026 ^{ns}	1.002 ^{ns}	.982 (.97–.99)**	.994 ^{ns}
Married	−.321 ^{ns}	.819 ^{ns}	.440 ^{ns}	.915 ^{ns}	1.092 ^{ns}	.992 ^{ns}
≥HS Equivalent	8.905 (±.865)**	4.181 (±1.131)**	4.488 (±1.049)**	1.742 (1.34–2.26)**	1.326 ^{ns}	1.392 (1.09–1.78)*
Comorbid Cat.	−.222 ^{ns}	.464 ^{ns}	−.758 (±.289)*	.970 ^{ns}	1.114 (1.03–1.20)*	.919 (.86–.98)*
HF ≤ 2 Months	−1.904 (±.533)**	−4.049 (±.788)**	−1.288 (±.648)*	.865 ^{ns}	.896 ^{ns}	.939 ^{ns}
NYHA Class	−3.805 (±.400)**	−.897 ^{ns}	−2.362 (±.485)**	.767 (.68–.87)**	1.004 ^{ns}	.836 (.75–.93)*
Diastolic HF	−3.921(±.418)**	−.747 ^{ns}	−1.905 (±.508)**	.797 (.70–.91)*	.854 ^{ns}	.937 ^{ns}
HF Etiology	.263 ^{ns}	−.886 ^{ns}	.047 ^{ns}	.983 ^{ns}	.930 ^{ns}	.946 ^{ns}
Country	2.278 (±.671)*	−10.925 (±.912)**	−6.458 (±.814)**	-	-	-
U.S.	-	-	-	1.115 ^{ns}	8.809 (4.85–16.00)**	3.422 (2.24–5.24)**
Australia	-	-	-	3.732 (2.45–5.68)**	4.610 (2.50–8.52)**	2.670 (1.74–4.11)**
Gender (female)	−1.323 (±.758)^{ns}	.896 (±1.001)^{ns}	−.240 (±.920)^{ns}	.934 (.75–1.17)^{ns}	1.087 (.85–1.39)^{ns}	.975 (.80–1.19)^{ns}
Full Model Fit	R^2=.243**	R^2=.189**	R^2=.139**	χ^2=428.720**	χ^2=193.722**	χ^2=162.045**

Note: For the logistic regression, the influence of country is relative to Thailand, heart failure type is relative to systolic/mixed heart failure, and heart failure etiology is relative to ischemic etiology. Adequate self-care indicates a score of ≥ 70 on the appropriate Self-Care of Heart Failure Index scale. β= adjusted regression slope coefficient (except where noted in italics = unadjusted slope coefficient), HF = heart failure, NS = non-significant, NYHA = New York Heart Association, OR = adjusted odds ratio (except where noted in italics = unadjusted odds ratio) SE = standard error.

* indicates p-value <.05,

** indicates p-value <.001,

^{ns} indicates not statistically significant.

Table 4

Determinants of Self-Care Maintenance by Gender

	Men (n=1171)			**Women (n=718)**		
	Self-Care Maintenance					
	β	**95% CI**	**p**	**β**	**95% CI**	**p**
Age	.207	.136 to .277	<.001	.128	.042 to .213	.004
Married	−.018		ns	−1.246		ns
≥HS Equivalent	8.151	6.025 to 10.278	<.001	9.816	6.983 to 12.649	<.001
Comorbid Cat.	−.520		ns	.223		ns
HF ≤ 2 Months	−2.486	−3.775 to −1.196	<.001	−.879		ns
NYHA Class	−3.828	−4.790 to −2.866	<.001	−3.868	−5.222 to −2.513	<.001
Diastolic HF	−3.828	−4.137 to −1.976	<.001	−4.838	−6.114 to −3.561	<.001
HF Etiology	−.148		ns	.816		ns
Country	1.675		ns	2.965	.909 to 5.021	.005
	Adequate Self-Care Maintenance					
	OR	95% CI	p	OR	95% CI	p
Age	1.021	1.010–1.032	<.001	1.009		ns
Married	1.053		ns	.633	.447–.898	.010
≥HS Equivalent	2.483	1.837–3.356	<.001	3.209	2.179–4.726	<.001
Comorbid Cat.	.986		ns	.989		ns
HF ≤ 2 Months	.734	.610–.882	.001	.909		ns
NYHA Class	.638	.553–.736	<.001	.724	.596–.881	.001
Diastolic HF	.712	.611–.829	<.001	.532	.444–.639	<.001
HF Etiology	.945		ns	1.059		ns
Country	1.394	1.091–1.781	.008	1.562	1.173–2.080	.002

Note: β= adjusted regression slope coefficient, CI = confidence interval, Cat. = category of the Charlson comorbidity index, HF = heart failure, HS = high school equivalent education, ns = not significant, NYHA = New York Heart Association, OR = odds ratio.

Table 5

Determinants of Self-Care Management by Gender

	Men (n=969)			**Women (n=643)**		
	Self-Care Management					
	β	**95% CI**	**p**	**β**	**95% CI**	**p**
Age	−.140	−.237 to −.043	.005	−.161	−.269 to −.052	.004
Married	.664		ns	.455		ns
≥HS Equivalent	3.344	.450 to 6.238	.024	4.995	1.500 to 8.490	.005
Comorbid Cat.	.520		.ns	.349		ns
HF ≤ 2 Months	−4.168	−6.191 to −2145	<.001	−4.028	−6.433 to −1.623	.001
NYHA Class	−.429		ns	−1.595		ns
Diastolic HF	−.041		ns	−1.451		ns
HF Etiology	−.880		ns	−.950		ns
Country	−13.204	−15.703 to −10.705	<.001	−8.504	−11.092 to −5.092	<.001
	Adequate Self-Care Management					
	OR	95% CI	p	OR	95% CI	p
Age	.986	.974–.998	.020	.985	.972–.999	.037
Married	1.070		ns	1.020		ns
≥HS Equivalent	1.308		ns	1.745	1.123–2.712	.013
Comorbid Cat.	1.130	1.024–1.247	.015	1.079		ns
HF ≤ 2 Months	.748	.590–.948	.017	1.073		ns
NYHA Class	1.038		ns	.869		ns
Diastolic HF	.854		ns	.731	.570–.938	.014
HF Etiology	.955		ns	.916		ns
Country	.354	.269–.480	<.001	.487	.346–.686	<.001

Note: β= adjusted regression slope coefficient, CI = confidence interval, Cat. = category of the Charlson comorbidity index, HF = heart failure, HS = high school equivalent educations, ns = not significant, NYHA = New York Heart Association, OR = odds ratio.

Table 6

Determinants of Self-Care Confidence by Gender

	Men (n=1180)			Women (n=722)		
	Self-Care Confidence					
	β	**95% CI**	**p**	**β**	**95% CI**	**p**
Age	−.001		ns	−.057		ns
Married	.584		ns	.048		ns
≥ HS Equivalent	5.111	2.568 to 7.653	<.001	3.278		ns
Comorbid Cat.	−1.191	−1.893 to −.490	.001	−.076		ns
HF ≤ 2 Months	−1.689	−3.234 to −.143	.032	−.548		ns
NYHA Class	−2.760	−3.913 to −1.607	<.001	−1.941	−3.618 to −.263	.023
Diastolic HF	−.948		ns	−3.070	−4.652 to −1.487	<.001
HF Etiology	−.774		ns	1.213		ns
Country	−6.357	−8.428 to −4.285	<.001	−6.695	−9.240 to −4.150	<.001
	Adequate Self-Care Confidence					
	OR	95% CI	p	OR	95% CI	p
Age	1.000		ns	.996		ns
Married	1.115		ns	.817		ns
≥ HS Equivalent	1.857	1.388–2.484	<.001	1.241		ns
Comorbid Cat.	.883	.814–.958	.003	.969		ns
HF ≤ 2 Months	.870		ns	1.003		ns
NYHA Class	.766	.670–.876	<.001	.857		ns
Diastolic HF	.949		ns	.761	.637–.909	.003
HF Etiology	.907		ns	1.014		ns
Country	.591	.463–.754	<.001	.647	.514–.883	.004

Note: β= adjusted regression slope coefficient, CI = confidence interval, Cat. = category of the Charlson comorbidity index, HF = heart failure, HS = high school equivalent educations, ns = not significant, NYHA = New York Heart Association, OR = odds ratio.

Table 7

Determinants of Self-Care by Gender: Factors and the Direction of Influence

	Self-Care Maintenance				Self-Care Management				Self-Care Confidence			
	Level		Adequate		Level		Adequate		Level		Adequate	
Variable	**Men**	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**	**Women**
↑ Age	↑	↑	↑		↓	↓	↓	↓				
Married				↓								
≥ HS Education	↑	↑	↑	↑	↑	↑		↑	↑		↑	
↑ Comorbid Cat.							↑		↓		↓	
HF ≤ 2 Months	↓		↓		↓	↓	↓		↓			
↑ NYHA Class	↓	↓	↓	↓					↓	↓	↓	
Diastolic HF	↓	↓	↓	↓						↓		↓

Note: Arrows indicate an increase ↑ or decrease ↓ in level or self-care, and increase or decrease in the odds of reporting adequate self-care. Only statistically significant relationships are represented. HF = heart failure, HS = high school equivalent, NYHA = New York Heart Association.