THE IMPACT OF WEIGHT STATUS ON THE ADOPTION OF SELF-CARE
BEHAVIORS AMONG HEART FAILURE PATIENTS

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A DISSERTATION
Submitted to the graduate faculty of The University of Alabama at Birmingham,
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy

BIRMINGHAM, ALABAMA
2013
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THE IMPACT OF WEIGHT STATUS ON THE ADOPTION OF SELF-CARE BEHAVIORS AMONG HEART FAILURE PATIENTS

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ABSTRACT

Self-care is a major component of heart failure management. Excess weight is a disease that may negatively affect a patient’s ability to effectively practice self-care. The project aimed to assess 1) the relationship between weight status and heart failure self-care behaviors and 2) the modification of the relationship between social support and heart failure self-care by weight status. This cross-sectional study utilized baseline data from a cohort of African-American and Caucasian participants diagnosed with heart failure. The heart failure cohort was formed from three larger studies (n=690) designed to assess the relationships among social support, self-care behaviors and hospital use in a population of participants with heart failure. Body mass index was used to measure weight status. Total heart failure self-care was assessed as well as the components of total self-care maintenance and self-care management. Chi-Square analyses and ANOVA tests were performed to determine differences in proportions and means of weight status and scale scores for total self-care, self-care maintenance and self-care management. The primary outcomes in the study are weight status for Aim 1 and total self-care, self-care maintenance and self-care management for Aim 2. The unadjusted and adjusted
association of considered key predictors with the primary outcomes were estimated by performing cumulative logistic regression models. Sample demographic variables were included in the models as adjustors. An interaction term of social support and BMI was tested at p <0.1 to determine if stratification of adjusted models for total self-care, maintenance and management were warranted. Female gender, African-American race, and low self-care knowledge differed according to weight status. More numerous comorbidities, higher heart failure knowledge and attending a regional referral center were associated with an increased odds of higher weight. Increased heart failure self-care efficacy, was associated with a decrease in the odds of inadequate total self-care, maintenance and management. High heart failure knowledge was associated with a decrease in odds of inadequate total self-care and maintenance. Compared to normal and overweight, being obese was associated with increase in the odds of inadequate self-care maintenance. The thresh hold for the interaction term of BMI and social support was not met. High levels of self-efficacy and heart failure knowledge are warranted when working to improve uptake of self-care among heart failure patients. These findings suggest that additional studies into the direct association of weight status on self-care are needed. From a public health perspective, there is a need for the development of patient-tailored, educational interventions aimed at improving self-care practice.

Key words: heart failure, self-care, BMI, weight status, social support
DEDICATION

I dedicate this dissertation to my mother, grandmother, and aunt who instilled in me at an early age the desire to dream big and work toward my goals.
ACKNOWLEDGEMENTS

First, I would like to thank God, for without Him this would not be possible. His blessings have allowed me to undertake and accomplish a major goal in my life.

I would like to thank my wonderful boyfriend Joe. You have provided much needed encouragement and support throughout this entire process. I would also like to thank our cat Julia who provided much needed stress relief and sat at my feet many long days and nights.

To my co-chairs Drs. Robin Lanzi and Raegan Durant, I want to first thank you both for working with me throughout all the transitions in my doctoral experience. Dr. Lanzi thank you for all your help with things on campus that distance precluded me from doing. Your words of encouragement to finish this journey will never be forgotten.

To Dr. Durant, I am truly thankful for all the time and guidance you have given me through my academic journey. I have learned so much in working with you and look forward to future research endeavors. You have truly been a friend and mentor throughout this process. Thank you for allowing me to use your data for my dissertation.

To my committee members Drs. Kristi Guest, Young-Il Kim, Dorothy Pekmezi and Cynthia J. Petri thank you for serving on my dissertation committee and providing me with valuable feedback and guidance.
I feel very grateful to have met and worked with you all. I will look back on this experience with wonderful memories. It has truly been an experience I will never forget.
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CHAPTER I

INTRODUCTION

Heart failure is a major source of morbidity and mortality, currently affecting 6 million people in the United States (Centers for Disease Control [CDC], 2012). By 2030, it is estimated that an additional 3 million people will be diagnosed with the condition—a 25% increase in prevalence since 2010 (Roger, et al., 2012). Prevalence for heart failure increases with age, with 10 per 1,000 U.S. adults >65 years old at risk for developing the condition (Roger et al., 2012). Survival of heart failure has improved over time but mortality remains high. Over 50% of patients die within 5 years of diagnosis (Roger et al., 2012).

Chronic conditions such as diabetes, hypertension, and obesity put an individual at increased risk for developing heart failure (Hodges, 2009). In 2008, 8% of the adult population had diabetes while 36.8% were classified as prediabetic (i.e. abnormal fasting glucose levels). According to the National Health and Nutrition Examination Survey (NHANES), for years 2005 -2008, 33.5% of U.S. adults ages 20 and older were hypertensive (Roger et al., 2012). Among heart failure patients, 75% have hypertension before diagnosis (Roger et al., 2012). For years 2007-2008, roughly 68% of adults had a body mass index (BMI) ≥ 25, while 33% had a BMI ≥ 30 (Roger et al., 2012). According to the Framingham Heart Study, a 1kg/m² increment increase in BMI increased the risk of heart failure by 5% for men and 7% for women (Hubert, Feinleib, McNemary, & Castelli, 1983; Sager et al., 2008).
Current treatment guidelines for heart failure consist of a combination of self-care (dietary management through sodium-restricted diets, exercise, and daily weigh-ins) and prescribed medication (Schnell-Hoehn, Naimark, & Tate, 2009). Self-care is defined as “a naturalistic (real world) decision-making process that individuals use in choice of behaviors that maintain physiological stability (symptom monitoring and treatment adherence) and the response to symptoms when they occur” (Riegel, Lee, Dickson, & Carlson, 2009). The basis for naturalistic decision-making is that it focuses more on processes than outcomes. Decisions are made based on a particular situation, and the context of the situation influences the decision-making process. Finally, practical decisions are based on information that is available at the time (Lipshitz, Klein, Orasanu, & Salas, 2001). Those who follow medication regimens and consistently perform self-care can improve their quality of life by 30% and optimize health outcomes such as decreases in mortality and hospitalization (Albert, 2008; Annema, Luttik, & Jaarsma, 2009; Hodges, 2009; Krumholz et al., 2002).

Individuals who are overweight or obese have a greater likelihood of developing heart failure than those of normal weight (Malnick & Knobler, 2006). Yet, once diagnosed with heart failure, overweight or obese individuals have a lower risk of mortality compared to those with normal weight (Hall et al., 2005; Mokdad et al., 2003). Causes of this “obesity paradox” are not well understood (Aronson et al., 2010; Curtis et al., 2005; Kunju, Badarudeen, & Schwarz, 2009). Results from studies in this area have been mixed. Issues surrounding ways to accurately measure adiposity, differences in BMI classification cut points, and differences in study design are cited as reasons it is
difficult to compare findings and identify causes of the paradox (Amundson, Djurkovic, & Matwiyoff, 2010; Anker & von Haehling 2011; Arena & Lavie 2010;).

Obesity’s role in heart failure has been studied mainly from a clinical perspective to understand its impact on heart failure morbidity and mortality. Few studies have explored the direct impact obesity has on the performance of specific self-care behaviors (Bayliss, Steiner, Fernald, Crane & Main, 2003). Furthermore, most research examines the impact of social support, self-care knowledge, and individual characteristics in direct relationships with heart failure self-care (Riegel & Carlson 2002; Dickson, Deatrick, & Riegel, 2008; Lee et al., 2009). It is not well understood how weight status strengthens or weakens the relationships among social support, self-care knowledge and heart failure self-care.

The dissertation analyzed baseline data from three larger cross-sectional studies among 736 African-American and Caucasian heart failure participants. Participants were recruited from three hospitals: one teaching hospital and one safety-net hospital in Birmingham, Alabama and one regional referral center in Tuscaloosa, Alabama. Data were collected using both in-person and telephone interviews. The overarching goal of this dissertation was to investigate the relationship among weight status (as measured through BMI) and heart failure outcomes between African-Americans and Caucasians with heart failure. The study had two specific aims: 1) Understand the relationships of sociodemographic, clinical, and psychosocial factors with weight status (using body mass index) in a sample of African-American and Caucasian participants with heart failure; and 2) Assess the relationship between weight status and heart failure self-care among a baseline sample of African-American and Caucasian participants with heart failure.
The hypotheses associated with each specific aim were as follows:

**Specific Aim 1:**

1a) Female heart failure participants would be more likely to be overweight or obese than male heart failure participants.

1b) African-American heart failure participants would be more likely to be overweight or obese than Caucasian heart failure participants.

1c) Participants with lower levels of perceived social support would be more likely to be overweight or obese than those with moderate or high levels of social support.

1d) Participants with lower heart failure self-care knowledge would be more likely to be overweight or obese than those with high levels of heart failure self-care knowledge.

**Specific Aim 2:**

2a) Overweight or obese participants with heart failure would have lower levels of total self-care compared to those of normal weight.

2b) Overweight or obese participants with heart failure would have lower levels of self-care maintenance compared to those of normal weight.

2c) Overweight or obese participants with heart failure would have lower levels of self-care management compared to those of normal weight.

2d) The relationship between perceived social support and self-care would be strongest among participants who were overweight and obese compared to those of normal weight.
Conceptual Framework

Understanding how weight status may negatively affect the adoption and maintenance of self-care practices is an important step in improving patient outcomes. The conceptual diagram (Figure 1) depicted a mechanism for exploring the relationship between weight status (as measured through BMI) and self-care among persons with heart failure. Weight status was used to determine its impact on the relationship between perceived social support and self-care knowledge with self-care. It was hypothesized that individuals who were overweight or obese would have lower levels of perceived social support and self-care knowledge compared to those of normal weight. The following sections describe the constructs used in the diagram.

Patient Psychosocial Factors

Social Support

Social support has been identified as an important component of heart failure disease management. Positive social support from friends, family and healthcare providers has been associated with lower rates of re-hospitalizations and improved quality of life (Sauders, 2008). In 2005, Luttik, Jaarsma, Moser, Sanderson and van Veldhuisen conducted a review of 17 studies to determine the impact of social support on heart failure outcomes such as mortality, rehospitalizations and quality of life. They found a strong relationship between social support, rehospitalizations and mortality where positive social support was associated with a decrease in rehospitalizations among heart failure patients.
Social support is believed to act mechanistically as a buffer to stress, thus causing a change in outlook and an increase in likelihood of performing self-care behaviors (DiMatteo, 2004). It is also thought that social support provides a coping mechanism through supportive relationships, making it easier to deal with diagnosis, management and adjustment to illness by promoting medication adherence and uptake of self-care behaviors (Arestedt, Saveman, Johansson, & Blomqvist, 2012).

**Self-care Knowledge**

Self-care knowledge entails knowing what to do to keep symptoms under control and what steps to take if they worsen. A lack of knowledge can impede a person’s ability to manage his/her disease (Cameron & Thompson, 2012; Riegel & Carlson, 2002). Conflicting disease management guidelines in the setting of multimorbidity have been attributed to lack of self-care knowledge. Guidelines for one condition may exacerbate heart failure symptoms, thus affecting the extent to which a person adequately performs self-care (Bayliss, Steiner, Fernald, Crane, & Main 2003). In addition, low literacy levels have also been attributed to lack of self-care knowledge. A person, that has trouble understanding guidelines and/or how to effectively perform self-care behaviors may be less likely to do so (Clark, Freydberg, McAlister, Tsuyuki, Armstrong, & Strain, 2009; Macabasco-O’Connell et al., 2011).

**Patient Clinical Data**

Clinical factors are those that give an indication of a patient’s current health status. They present a health profile that can be used in addition to a person’s weight status to determine the likelihood of adopting self-care behaviors. Research indicates that people with heart failure who suffer from multiple conditions have difficulty maintaining
self-care behaviors (Dickson, Buck & Riegel, 2012; Wong, Chaudhry, Desai, & Krumholz, 2011). A person with heart failure who is obese or overweight may suffer from this profile more than a normal weight person and as a result be less likely to practice self-care. People with more severe heart failure may be less likely to uptake self-care behaviors compared to those with less severe heart failure (Riegel, et al., 2009; Rockwell & Riegel 2001) Knowing a person’s level of severity may be beneficial in developing more tailored self-care interventions (Caldwell, Peters, & Dracup 2005).

**Patient Sociodemographic Data**

Differences in factors such as age and gender may affect the uptake of self-care or the types of social support most effective for uptake of self-care. Research has indicated factors that drive self-care practice may vary based on sociodemographics such as gender (Lee et al., 2009; Riegel, Dickson, Kuhn, Page, & Worrall-Carter, 2010). Understanding these differences can provide more insight into how a potential moderating factor such as weight status affects which aspects of self-care are performed.

**Heart Failure Self-care**

Self-care is an active, ongoing process. It includes maintaining a level of health in which individuals engage in behaviors such as eating a low sodium diet to help promote disease stability and management requiring individuals respond to symptoms that develop (Riegel et al., 2009). Both self-care maintenance and management are comprised of several steps. Self-care maintenance involves symptom monitoring and adhering to behaviors to promote baseline health and functional status. When individuals
perform self-care maintenance on a consistent basis, they have improved outcomes, and avoid rehospitalizations (Riegel et al., 2009).

Self-care management is a multifaceted process that is comprised of symptom recognition and evaluation, treatment implementation and treatment evaluation. Symptom recognition is the ability to notice when symptoms change (i.e. leg swelling). Once symptoms are recognized, an assessment (evaluation) of change in symptoms follows. Successful symptom evaluation leads to treatment implementation in which a treatment such as taking a diuretic is used to lessen symptoms. Finally, the individual evaluates the treatment for effectiveness (Riegel et al., 2009).

The third component, self-care confidence, measures an individual’s confidence in his or her ability to perform self-care behaviors (Riegel et al., 2009). This self-care component is important for both maintenance of baseline health and management of symptoms. As confidence in performing maintenance and management activities improve, individuals’ sense of control over their treatment regimen builds.

**Body Mass Index**

Body mass index (BMI) is a measure of height and weight that is commonly used to classify individuals as normal weight, overweight, or obese for medical and general purposes (World Health Organization [WHO], 2013). Although different cut points have been used to classify individuals as overweight or obese, researchers and health care professionals have pointed to an increased risk of development of chronic conditions with higher levels of BMI (CDC, 2012; Cignarelli & Lamacchia, 2007; Malnick & Knobler, 2006). In 2008, sixty-one percent of Americans were defined as overweight or obese with numbers climbing annually (Sagar, Ahmed, Adams, & Whellan, 2008). As rates of
obesity continue to rise in the U.S., more people will be at increased risk for developing heart failure. An improved understanding of how obesity affects self-care behaviors is needed to facilitate the development of more effective treatment guidelines that address barriers to self-care. BMI was used in the conceptual model because of its ease in comparison of results based on weight status with other studies and because of its prominent use in the healthcare field.

**Study Significance**

Examining the relationships between self-care with weight status may provide important insights into ways to improve patient outcomes. As noted by Dunbar et al. (2008): “Clinically relevant studies that are theoretically based but behaviorally focused are clearly needed to promote appropriate understanding of heart failure self-care.” This cross sectional study was unique in that it was one of the first to examine the novel idea of a direct association between obesity and self-care behaviors within the heart failure population. The study bridges the gap in knowledge regarding barriers to self-care practice.
CHAPTER II
REVIEW OF THE LITERATURE

Heart failure is a chronic, progressive condition that occurs when the muscle is unable to pump enough blood through the heart to meet the body’s needs for blood and oxygen (American Heart Association [AHA], 2013). A patient’s weight status may negatively affect his/her ability to effectively practice self-care. Current heart failure research seeks to understand the relationship between obesity and heart failure morbidity and mortality, but its impact on the adoption of self-care behaviors is not well understood.

Practicing self-care behaviors can lead to higher quality of life and improved patient outcomes (Barnason, Zimmerman, Young, 2012; Shively, et al., 2012; Tung, Lin, Chen, Chang, Lin, & Chou, 2012). However, few patients perform self-care adequately or consistently (Carlson, Riegel, & Moser, 2001; Chriss, Sheposh, Carlson, & Riegel, 2004; Riegel, Lee, & Dickson, 2011). As a result, six-month rehospitalization rates as high as 40% are common within this population (Annema et al. 2009; Hodges, 2009). Understanding the reasons why patients fail to perform self-care behaviors is key to improving outcomes and reducing high rates of mortality and rehospitalization from the disease.

This review begins with an overview of heart failure types and classification system. The review then focuses extensively on studies that highlight factors that affect self-care among heart failure patients, the issues surrounding current disease management programs related to self-care, current findings regarding the obesity paradox and difficulty in understanding its cause. Research published since the year 2000 was used in
the review. Study types included in the chapter consist of review articles, primary and secondary quantitative data analyses, and qualitative studies.

**Heart Failure Overview**

Signs and symptoms of heart failure are noted by shortness of breath and activity intolerance. As the disease progresses, persons with heart failure may have difficulty breathing even while resting or lying down. Fatigue or exercise intolerance causes a patient to tire easily and have general feelings of fatigue. Patients may also experience swelling in the feet, ankles, or legs. Coughing can also occur with heart failure and may become more frequent as the disease progresses (Heart Failure Society of America [HFSA], 2006).

Heart failure is divided into two types: left-sided and right-sided. Left-sided heart failure occurs when the left ventricle must work harder to pump the same amount of blood under normal conditions. Two types of left-sided heart failure exist. Systolic failure occurs when the left ventricle loses its ability to contract normally while diastolic failure occurs when the left ventricle loses its ability to relax normally (AHA, 2013). Right-sided (right ventricular) occurs as a result of left-sided failure (AHA, 2013).

In addition to the physiologic subtypes, the severity of left-sided heart failure symptoms can be divided into four functional classifications (Class I, II, III, and IV) based on the New York Heart Association (NYHA) Functional Classification system (HFSA, 2006). Class I individuals have no disease symptoms and no limitation in ordinary physical activity. Class II exhibit mild symptoms and slight limitation during activity but are comfortable at rest. Class III individuals have more limitations in activity because of more severe symptoms even during light activity. They are comfortable only
at rest. In Class IV, the person experiences severe symptoms and limitations even while at rest (AHA, 2013).

**Heart Failure Self-care**

Self-care is an important means by which patients keep heart failure under control and improve outcomes. The Riegel Heart Failure Self-care Model (Figure 2) was developed to graphically illustrate the process by which heart failure self-care occurs. The model shows how five stages of naturalistic decision-making (symptom monitoring and treatment adherence, symptom recognition, symptom evaluation, treatment implementation, and treatment effectiveness) are conducted in the context of self-care maintenance, self-care management and self-care confidence (Riegel et al., 2004). The underlying assumption of the model is that individuals who have heart failure and are successful with self-care must embrace health behaviors to stay physiologically stable (maintenance). Individuals must also be able to address symptoms when they arise in a timely manner (management). An increase in self-efficacy occurs when patients build confidence in their ability to control their heart failure and treatment regimens (Riegel et al., 2004). The extent to which self-care is carried out can be affected by many factors such as patient functional status, level of heart failure knowledge, comorbidities and social support (Dickson et al., 2012; Stromberg, 2005).

Research has been conducted to understand the exact mechanism by which self-care works to improve heart failure outcomes. One theory proposed is that self-efficacy mediates/and or moderates the influence of self-care maintenance and management on health outcomes (Riegel, Lee, Dickson, & Carlson, 2009). Several studies were conducted that test this theory. Salyer, Schubert, and Chiarania (2011) conducted a
secondary analysis using data from a large AHA-sponsored study of self-care and quality of life in heart failure patients that examined the effects of supportive relationships on self-care behaviors and mediating effects of self-care confidence in heart failure patients. Patients were included in the study if they were diagnosed with New York Heart Association classification I-IV for three months, had ejection function equal or lower than 40%, underwent standard medical treatment for heart failure, were ≥ 18 years of age, and were able to read English. Demographics and clinical characteristics were collected using a mailed demographic questionnaire and medical record review. Supportive relationships were categorized using three variables: 1) social support, marital status and size of social network. The Medical Outcomes Study Social Support Scale (MOS-SSS) was used to measure size of network and social support. The first question on the scale, which asked how many relatives or friends participants felt close to was used to measured size of social network. The remaining items were used to score perceived levels of social support. Total self-care, self-care maintenance and self-care confidence were measured using the 15-item Self-care for Heart Failure Index. Results from the study found that self-care confidence mediated the relationship between social support and self-care management. Perceived social support had a positive effect on self-care maintenance and an indirect positive effect on self-care management through self-care confidence (β = .27; p=0.03). In terms of self-care maintenance, the size of the social network had a negative effect on self-care confidence (β = -.22; p= 0.015). However, the direct relationship between self-care confidence and self-care maintenance was positive (β= .22; p=0.001).
Another study by Maeda, Shen, Schwarz, Farrell and Mallon (2012) was conducted among 252 heart failure patients that determined whether self-efficacy as a mediator, explained the associations of social support and depression with treatment adherence in heart failure. Patients were recruited from cardiology outpatient clinics between 2005 and 2009. Patients were eligible to participate if they were ≥ 18 years of age, showed competency in reading and writing, and spoke English or Spanish on a 6th grade level. Semi-structured interviews were used to obtain demographic data. Self-efficacy was assessed using a 17-item Heart Failure Self-efficacy scale that was constructed by the authors. Social support was measured using the (MOS-SSS); depression was measured using the Center for Epidemiologic Study Depression scale. Treatment adherence was measured using the Medical Outcomes Study Specific Adherence Survey, and the authors also assessed medication usage, diet, exercise, and stress management. Results showed greater levels of perceived social support had a positive effect on treatment adherence ($\beta= 0.29$, $t= 4.50$; $p= <0.001$). Greater self-efficacy was associated with treatment adherence ($\beta= 0.67$, $t= 11.26$; $p= <0.001$) when included in the model with social support ($\Delta R^2 =0.45$; $\Delta F (1, 255) = 126.77$; $p = <.001$). Self-efficacy fully mediated the relationship between social support and treatment adherence. Low levels of depression ($\beta= -0.15$, $t= -2.32$; $p= <0.05$) and greater social support ($\beta= 0.25$, $t= 3.86$; $p= <0.001$) were associated with better treatment adherence ($R^2 =0.16$; $\Delta F(11, 255) = 3.97$; $p = <.001$). Self-efficacy was positively associated with treatment adherence ($\Delta R^2 =0.29$; $\Delta F(1, 254) = 118.29$; $p = <.001$). Self-efficacy fully mediated the effect of depression.
(direct path reduced from $\beta = -0.15$ to $\beta = -0.02$ and no longer significant, $p=0.68$; 95% CI $= -0.016$ to $-0.003$) and social support (direct path reduced from $\beta = 0.25$ to $\beta = 0.09$ and no longer significant, $p=0.11$; 95% CI $= 0.078$ to $0.250$) on treatment adherence.

Both studies supported the theory that self-efficacy mediated the relationship between self-care and factors such as social support. Equally important in understanding how self-care works is identifying factors that may impede the uptake of self-care behaviors. The following sections provide an overview of factors that have been studied in the literature for their influence on heart failure self-care practice.

**Factors Influencing Self-care among Heart Failure Patients**

**Social Support**

Many definitions have been developed to define social support. One definition, developed by Shumaker and Brownell (1984), described it as “an exchange of resources between two individuals perceived by the provider or the recipient to be intended to enhance the well being of the recipient” (Driscoll, Davidson, Clark, Huang, & Aho, 2009; Riegel, Vaughan, Dickson, Goldberg, & Deatrick, 2007). Current research involving social support examines this area using four main constructs: emotional, instrumental, informational and appraisal support. Emotional support involves caring, love, empathy, and trust. Instrumental support is defined as providing a tangible good or service. Informational support provides information to another in times of stress. Appraisal support involves giving a person information that allows them to make a self-evaluation (Langford, Boyner, Maloney, Lillis, 1997; Luttik et al., 2005).
The relationship between social support and heart failure self-care has been studied in depth in the literature (Dickson et al., 2012; Howie-Esquível & Spicer, 2012; Hwang, Fleischmann, Howie-Esquível, Stotts, & Dracup, 2011). Social support is believed to lower or buffer stress which makes it easier to adhere to daily self-care activities (Gallagher, Luttik & Jaarsma, 2011; Graven, & Grant 2012; Sayers, Riegel, Pawlowski, Coyne, & Samaha 2008).

A study by Gallagher et al. (2011) examined types of social support provided to heart failure patients and the impact of differing levels of social support on their self-care. The study was a secondary analysis of patients undergoing hospitalization for heart failure as part of a larger study. Self-care was assessed using the European Heart Failure Self-Care Behavior Scale. Social support was categorized into categories of high, moderate and low based on presence of a partner and their perception of the support received from their partner. They found patients that had high levels of social support were more likely to engage in activities such as monitoring fluid intake, consulting a healthcare professional for weight gain, exercising regularly and taking medications. Having a partner available was not sufficient by itself to influence patient’s heart failure self-care. However, they did note that social support received from partners should match the patient’s need to be most effective. A meta-analysis of 29 studies conducted by Gallant (2003) on the relationship between social support and chronic illness self-management found that social support specific to a disease or regimen was related to better self-management behaviors. The findings above reiterate the impact positive social support can have on the adoption of self-care behaviors. In addition, social support has been shown to be most effective in
improving self-care when it matched patients’ needs. Further investigation into the exact mechanism by which social support improves heart failure self-care is needed.

**Comorbidities**

Many individuals with heart failure suffer from other chronic conditions (Riegel et al., 2009; Watson & Summers, 2009). Two thirds of people with heart failure have at least two or more comorbidities. People 65 and older with heart failure have 5 or more comorbidities (Mills & Chambers, 2012). The most common comorbidities among persons with heart failure include hypertension, hypercholesterolemia, kidney disease, diabetes, and obesity (Wong, et al., 2011). Comorbidities impede heart failure self-care by causing individuals to spend time and energy managing many diseases that often require additional medications, dietary restrictions, and self-care regimens (Corser & Dontje, 2011; Schuz, Wurm, Warner, & Ziegelmann, 2012). The additional self-care and health considerations for comorbidities can make it difficult for individuals to prioritize any specific self management regimen to control a corresponding condition (Kerr et al., 2007).

In the literature, comorbidity has been shown to have a negative impact on the uptake of heart failure self-care (Schuz et al., 2012; Zhang et al., 2003). A meta-analysis of three mixed method studies by Dickson, et al. (2012) explored how comorbidities influenced heart failure self-care. Multiple conditions made performing self-care behaviors, such as dietary adherence and symptom monitoring, difficult when differentiating between multiple conditions. Bayliss et al.(2003) conducted qualitative (one-on-one) interviews (n= 16) among participants with heart failure to identify perceived barriers to self-care. The majority (n=14) of participants reported that
symptoms of one condition interfered with performing self-care for another. Nine participants stated that a therapeutic or an adverse effect from treating one condition exacerbated problems with another condition. Participants also stated that the severity of one condition (i.e. loss of vision) made it difficult to manage other conditions.

A recent study by Dickson, Buck, & Riegel (2013) explored the moderating effect of comorbidities (i.e. cancer, COPD, diabetes, stroke) on the relationship between self-efficacy and self-care in (n=114) mixed methods studies. Parametric statistics were used to examine the relationship of self-efficacy, self-care, and comorbidity. Tests for moderation were also used to examine the effect of comorbidity on the relationship between self-efficacy and self-care. Qualitative meta-analysis was used to re-analyze in-depth accounts of heart failure self-care and explore emergent themes of self-efficacy within the context of co-morbid conditions. A final analysis integrated data with qualitative data used to explain quantitative findings. A significant correlation was found between self-care maintenance and comorbidities (r = -253; p=.03). There was also a significant difference in self-care maintenance between low (0-1) and moderate/high (2-3) comorbidity groups (F= 5.96, df[1, 112], p=0.19). They found that comorbidity influenced the relationship between self-efficacy and maintenance when participants have moderate (2-3) to high (> 4) comorbidities. Specifically for self-efficacy and self-care maintenance, there was a significant moderating effect among those with a moderate level of comorbidities. The interaction term entered significantly predicted self-care maintenance (b = .620, p =0.022, F_{change} = 5.61, df [6, 48], p =0.22). Integration of data analysis showed strong parallels (85%) between scores on the self-care confidence scale and qualitative accounts of self-efficacy. Qualitative data included in the study helped to
explain how the level of self-efficacy modified the relationship between self-care and self-efficacy. The overarching theme from qualitative analysis was that self-efficacy for specific heart failure self-care maintenance and management behaviors influenced how the behaviors were carried out in the context of other conditions. Working with individuals to understand the context in which they manage symptoms is important to improving outcomes. Individuals with heart failure often express confusion with multiple treatment regimens that conflict with each other making it harder to maintain desirable outcomes (Corser & Dontje, 2011). There is a need for an integrated system of care that includes a person’s entire health care team to develop a comprehensive plan of care.

**Self-care Knowledge**

Individuals with heart failure often learn about self-care through educational programs. These programs are often designed to promote behavior change, teach specific skills to practice daily self-care as well as provide support so patients can better control their symptoms (Effing et al., 2007). Self-care knowledge is not a guarantee for performing self-care behaviors. However, having an understanding of what to do to maintain their condition may increase self-efficacy, which in turn may increase likelihood of performing self-care behaviors (Annema et al., 2009; Hodges, 2009).

Studies that measure program effectiveness on increasing self-care knowledge have produced mixed results. DeWalt et al. (2004) developed and pilot tested a disease management program among 23 heart failure patients with low literacy. Materials were developed by a team of physicians, pharmacists, nurses and health educations to focus on building specific self-care skills rather than general knowledge. Topic areas included an explanation of heart failure, avoidance of salt, and plans to implement a self-care
strategy. Results showed that baseline mean knowledge score did not significantly improve after the intervention (mean difference -3.3% (95% CI: -9.5, 2.8). However, for specific activities, the proportion of participants who weighed themselves daily increased to 100% from 32% at baseline.

A randomized control trial by Caldwell, Peters, and Dracup (2005) sought to determine whether a simplified educational program focused on a single component of disease management (symptom recognition and management of fluid weight) could improve knowledge, participant reported self-care behavior, and severity in a rural setting. A total of 36 participants were randomized into intervention (simplified education program with follow-up phone call) and control groups that received standard care. Knowledge, self-care behaviors, and heart failure severity were measured at enrollment and at 3 months. There were no differences between groups in terms of knowledge and self-care behaviors at baseline. However, knowledge and self-care related to daily weights improved significantly in the intervention group at three months (p=.03).

Another study that used a randomized control trial design was recently conducted by Kommuri, Johnson & Koelling in 2012. The purpose of the study was to observe changes in performance on heart failure knowledge assessment before and after hospital discharge. Participants were randomized into two groups with controls receiving standard discharge process (n= 114) while those in the intervention (n= 113) received 1 hour one-on-one teaching sessions with a nurse. A 30-point heart knowledge questionnaire was administered to participants prior to discharge and at 3 months after discharge. Results showed that those in the intervention group had a significant increase
in knowledge score (p= <.001) compared to controls at the 3 month follow-up. In terms of total heart failure knowledge scores, participants in the intervention group had a significantly greater increase in score versus controls (1, 0 to 4 vs. 0, -2 to 2, p =.007).

The studies above highlight the effect of educational interventions on increasing self-care knowledge among heart failure patients. Although the studies show positive changes in knowledge levels, a critique would be all three had short follow-up times (3 months). There is a need for studies in the literature that assess changes in self-care knowledge over a longer period of time.

**Gender**

Although numerous studies have examined the impact of factors such as social support and comorbidity on self-care, few have studied the role of gender. Studies stratified by gender have mainly aimed to understand self-care as it relates to medication adherence rather than disease management (Evangelista, Berg, & Dracup, 2001; Rockwell & Riegel, 2001; Wu, Lennie, & Burkhart, 2008). An improved understanding of issues surrounding self-care unique to men or women can facilitate the provision of tailored care, thus improving quality of life (Riegel et al., 2003).

Heo et al. (2007) conducted a study that assessed differences in self-care by gender to determine its effect on heart failure patients. The cross-sectional study collected information on the frequency of performing self-care behaviors (daily weighing, eating a low sodium diet, regular physical activity, maintaining current body weight, and getting a flu shot) using the Riegel Self-care Heart Failure Index. Results from the study showed that better self-care behaviors for both men and women were correlated with perceived control, knowledge, and self-care confidence. For men,
perceived control and heart failure management knowledge was significantly related with greater self-care ($r^2 = .18; p=.001$) whereas for women, self-care confidence and poor functional status were related to increased self-care ($r^2 = .35, p= <0.001$).

Thomas and Clark (2011) conducted a review of 6 articles to increase the understanding of the relationship between gender and heart failure self-care. A literature search was conducted utilizing studies published between the years 1995 and 2010. Studies within the review included adults over 18 years of age, were published in English, and specifically explored the influence of gender using qualitative or mixed methods (qualitative and quantitative). Qualitative research covered areas as physical limitations, negative emotions/losses, support/deepening relationships, rejuvenate/rest, hope, and uniqueness of gender. Results showed that overwhelming physical limitations such as high fatigue, shortness of breath affected the everyday lives of both sexes. Both sexes reported life after a heart failure diagnosis as more negative when compared to past functioning and prior social roles. However, women were reported as experiencing more feelings of anger and hate toward their diagnosis and a greater loss of hope. The role and importance of supportive relationships differed based on gender. Having someone available to talk was important for women whereas men placed more emphasis on tangible support from family members who were involved in their care.

There is a persistent need for more gender-specific studies involving self-care. As shown, the role of psychosocial factors such as social support, may differ by gender. It may be important to take gender into account when developing interventions, to determine what factors may have the most impact on enhancing knowledge levels and facilitating the uptake of self-care.
**Depression**

Depression is a condition that affects many heart failure patients (Paukert, LeMaire, & Cully, 2009; Watson & Summers, 2009). Prevalence rates of depression among persons with heart failure are estimated to vary between 15% and 20% (Lea, 2009). Depression is associated with increased mortality among outpatients and inpatients (Thomas et al., 2008). Depression among heart failure patients is associated with reduced quality of life and higher risk of hospital readmission and mortality (Dekker, Peden, Lennie, Schooler, & Moser, 2009). Persons with heart failure who are depressed are also more likely to report lower perceived social support and increased pessimism about their ability to adequately perform self-care (Allman, Berry, & Nasir, 2009; Vollman, La Montagne, & Hepworth, 2007). Depressed patients are more likely to display avoidant behavior toward their diagnosis and treatment guidelines which in turn may lead to an unwillingness to learn and perform self-care (Albert & Zellar, 2009; Riegel et al., 2009; Maeda el al., 2012; Mills & Chambers, 2012).

**Self-care Interventions**

Self-care educational programs are delivered in variety of methods that included, one-on-one counseling, telemonitoring, and group settings (Otsu & Moriyama, 2011; Riley, Gabe, & Cowie, 2012). Given this range, the need to evaluate programs becomes increasingly important in order to determine what components are successful in facilitating self-care. A review by Boyd, Turner, Thompson and Stewart (2011) assessed the effectiveness of educational interventions among heart failure patients. Using studies published between 1998-2008, the review examined interventions that used a variety of methods (one-on-one counseling, telephone guidance, and home visits with varying
length of sessions) to deliver educational components. Results showed measures such as quality of life, readmission rates, and self-efficacy improved after interventions. Literacy and depression remained unchanged. However, because the programs differed in design, length and sample size, it was impossible for the authors to pinpoint common successful components of each program. The authors note in the review that tailoring educational interventions to an individual’s needs and preferences may work to empower the patient to change behaviors, which may positively affect disease outcomes.

Another review by Willey (2012) aimed to understand the best method for structuring telemonitoring, telephone interventions and disease management programs for patients once released from hospital to increase uptake of self-care. Results showed that multi-disciplinary teams, with effective structure that used a wide range of expertise, were the most beneficial for patients. However, similar to Boyd et al. (2012) variation in content, sample size and study design made it difficult to determine one or several common factors that contributed to success rates across program types.

**Obesity overview**

Obesity has become an urgent medical and public health issue that is associated with increased risk of chronic conditions such as diabetes, stroke, and chronic kidney disease (Hall et al., 2005; Kenchaiah, Gaziano, & Vasan 2004). Members of all age groups, races, economic and educational levels have been affected (Centers for Disease Control [CDC], 2012). In an effort to address this urgent issue, the American Medical Association (AMA) recently adopted a new policy which labels obesity as a disease “requiring a range of medical interventions, to advance obesity treatment and prevention” (Wilson, 2013).
Obesity is a major contributor to the overall burden of disease and is associated with higher medical costs in outpatient visits, outpatient and inpatient care (Rappange, Brouwer, Hoogenveen, & Van Baal, 2009). The economic burden of obesity is immense, with $17 billion dollars being spent annually in health care costs related to this condition (Sagar et al., 2008). As obesity rates continue to rise, so will the need for and use of healthcare related services (Arterburn, Maciejewski, & Tsevat, 2005).

**Obesity and Service Utilization**

Research is expanding to understand how obesity affects hospitalizations, service utilization, patient-doctor interactions, and health care costs (Schafer & Ferraro, 2007). A Canadian study by Alter et al. (2012) used data from the National Population Health Survey (n= 9386) to determine the extent to which uncomplicated obesity was associated with higher health care expenditures between years 1994 and 1996. Propensity matching was used to compare overweight (BMI 25-29.0 kg/m$^2$) and obese (BMI $>30$ kg/m$^2$) participants with baseline risk factors such as chronic disease, and lifestyle behaviors such as physical activity with normal weight-healthy controls. Matching was also used to assess differences in cumulative costs associated of with obese subjects compared to cumulative costs associated with normal weight participants. Results showed that, when assessed alone, obesity was not associated with significantly higher cumulative health costs over the follow-up period (CAD $8,294.67$ vs. $7,323.59$, p=0.27). However, in combination with other lifestyle factors such as smoking, obesity was associated with higher cumulative expenditures compared to normal weight individuals (CAD $14,186.81$ vs. CAD $7029.80$; p= <0.0001). Another study by Anderson et al., (2005) was conducted to estimate the proportion of total health care charges that were associated
with physical inactivity, overweight and obesity among participants in a United States health plan ages 40 and older. The randomly selected sample of 8,000 participants were divided into three groups based on the diagnosis of four conditions (diabetes, hypertension, heart disease and dyslipidemia). Predictive modeling was also used to estimate the proportion of health care charges associated with inactivity, overweight and obesity on the national level. The categories included participants with no disease diagnosis, 1 or more of disease diagnoses, and all four diagnoses. They found physical inactivity, overweight, and obesity contributed to 23% (95% CI 10%-34%) of health care plan charges and 27% (95% CI 10%-37%) of national health charges. Charges were highest for older participants and those with multiple chronic conditions.

To understand the influence of obesity on initial primary care visits, Bertakis and Azari (2005) conducted a randomized, prospective study of 509 patients at a university medical center. Patients were invited to participate in the study during initial telephone contact to request an outpatient primary care appointment. Participants were randomly assigned to 105 physicians for care. BMI was divided into classifications of 18.5 – 24.9 kg/m² (normal), 25-29.9 kg/m² (overweight) and ≥30 kg/m² (overweight). Sociodemographics, self-reported health status (using the MOS-short form-36), depression, height and weight (to assess BMI) was collected before the initial physician visit. Physician practice styles was examined by analyzing videotapes of medical visits using the Davis Observation Code (DOC) to detect physician style differences in areas such as history taking, discussing previously requested behavior, asking patients any questions regarding nutrition, and discussing what is to be accomplished in current interactions. Coders recorded the occurrence or non-occurrence of each DOC behavior
during successive 15-second observation intervals of the medical visit. Use of medical services and related charges were monitored for one year. Obesity was found to influence what happened during physician visits. Specifically, physicians spend less time educating obese patients about their health (p = 0.0062) and more time discussing exercise (p = 0.0075). Mean pre-visit satisfaction levels for obese patients were lower than that of normal weight patients (p = 0.0069).

These findings highlight the negative impact obesity can have on service utilization. In addition, the satisfaction of patient-provider interaction may have an adverse effect on patients seeking healthcare when needed. Though not directly related to heart failure self-care, patient provider interactions that are not perceived as supportive may negatively influence the extent to which patients communicate changes in their health status, which in turn, may increase the likelihood of poor outcomes.

The Relationship between Obesity and Heart Failure.

Research surrounding obesity and heart failure is mainly focused on the obesity “paradox”. This “paradox” states that although obesity is a risk factor for the development of heart failure, once diagnosed, overweight or obese persons have lower mortality rates (Gaddam, Ventura, & Lavie, 2011). The exact mechanism driving this paradox is not completely understood (Zavin et al., 2012). Studies have produced mixed results of its effect on mortality with some showing mortality rates decreasing at higher levels of BMI and others showing a U-shaped pattern with greater mortality at the lowest and highest ends of the BMI spectrum (Bozkurt & Deswal, 2005; Curtis et al., 2005; Kapoor & Heidenrich, 2010).
Clark, Chyu, and Horwich (2012) conducted a recent study which examined the association of BMI and waist circumference (WC) with outcomes in men and women (n=2718) with heart failure. The study included cohorts of patients with measured WC and BMI but were not mutually exclusive. Participants were from a university medical center for heart failure management and transplantation evaluation. Waist circumference was measured at the time of an initial clinic visit and at 3 months follow-up. Measurements were taken at the midpoint between lowest rib and iliac chest. Height and weight were recorded from initial clinic visit. Weight was also measured at 3-month follow-up.

Individuals with left ventricular ejection fraction and cachexia were excluded from the study. BMI was based on classifications from WHO and National Institutes of Health Guidelines that define normal weight as (BMI 18.5 to 24 kg/m²), overweight (BMI 25 to 29.9 kg/m²) and obese (BMI ≥ 30 kg/m²). For the analysis, the cohort was stratified by gender into two BMI groups of normal (18.5 to 24 kg/m²) and high (≥ 25 kg/m²). Waist circumference was divided into normal (<88 cm for women; <102 cm for men) and high (≥ 88 cm for women and ≥ 102 cm for men). The primary outcome for the study was death, urgent heart transplantation, or ventricular assist device replacement. Among men, 2-year event-free survival was better for high BMI (≥ 25kg/m²) compared to those with a normal BMI (63.2% vs. 53.5%, p <0.001). Among women, 2-year event-free survival was better for high vs. normal WC (78.8% vs. 63.1%; p =0.01). Multivariable analysis showed that normal BMI and normal WC were associated with higher risk for adverse outcomes in men and women. In addition, normal BMI compared to high BMI (≥ 25kg/m²) was associated with significantly worsened outcomes in male and female cohort with 34% and 38% higher risk respectively.
To understand the impact obesity may have on individuals with heart failure with preserved EF, Kapoor and Heidenrich (2010) conducted a study collecting data on 1,236 participants. Study inclusion criteria were: 1) a prior diagnosis of heart failure; 2) left ventricular ejection fraction (LVEF) of > 50%; and 3) documented BMI on echocardiography performed at one of three study laboratories between August 1998 and 2006. For patients with more than one echocardiogram with a LVEF > 50, the authors used the earliest echocardiography as the index date.

Comorbidities were assessed using the International Classification of Disease 9th diagnostic coding and included ischemic heart disease, cerebrovascular disease, peripheral arterial disease, heart failure, diabetes mellitus, hypertension, malignancy, and chronic obstructive pulmonary disease. Laboratory abnormalities were recorded if detected within 12 months before the index date. Baseline use of β blockers, digoxin, calcium antagonists, and statins were also included with the same criteria. Diastolic dysfunction was defined as mitral inflow E-wave deceleration time >240ms or <160ms; E velocity to tissue Doppler velocity (E base of lateral wall) ratio of > 15; tissue Doppler velocity < 0.8 cm/s, mitral inflow velocity E/A velocity ratio of > 1.5 or < 0.75. BMI was divided into seven categories (<20, 20-25, 26-30, 31-35, 36-40, 41-45, and >45 kg/m²).

Results from the study showed that mean ejection fraction was 59.6% ± 5. In terms of survival, all-cause mortality at 1 year decreased with increasing BMI (55% if BMI was <20kg/m²; 38% if BMI 20-25kg/m²; 26% BMI 26-30 kg/m²; 25% BMI 31-35 kg/m²; 17% BMI 36-40 kg/m²; and 18% BMI 41-45 kg/m² respectively). For levels of BMI above 45, mortality increased by 25%. Proportional hazards models, adjusted for
patient age, history, medication, laboratory and echocardiographic parameters, showed
significant differences in mortality ratios for the different BMI ranges relative to the 25-
30 kg group (p < 0.0001). Hazard ratios for mortality by BMI that were adjusted for age,
labs, medications and echocardiographic findings showed a U-shaped relationship for
increased mortality for the lowest [1.68 (95% CI, 1.04-2.69) for BMI <20 kg/m²] and
highest [1.38 (95% CI .74-2.6 ) for BMI ≥ 45 kg/m²] levels of BMI (p<0.0001)

Curtis et al. (2005) conducted a secondary cross-sectional study (n=7,767) which
examined weight and health outcomes (hospitalization and mortality) among outpatients
with stable disease and enrolled in the Digitalis Investigation Group (DIG) trial. The
DIG trial was a randomized control trial which studied the effect of digoxin (used in heart
failure to increase the strength of heart contractions) among 7,767 heart failure
participants at 302 centers across the U.S. and Canada between 1991-1993. Participants
with LVEF less than 45% were enrolled in the main component of the trial and those with
LVEF greater than 45% were enrolled in the ancillary study. The primary endpoint of the
study was all-cause mortality within 37 months of randomization. Other outcomes
included death due to cardiovascular causes, death due to worsening heart failure, and
hospitalization for worsening heart failure. BMI was used to classify participants into
groups of underweight (< 18.5 kg/m²), healthy weight (18.5-24.9 kg/m²), overweight
(25.0-29.9 kg/m²) and obese (≥30 kg/m²). Cox proportional hazard models were used to
assess risk associated with BMI groups over a 37-month follow-up period. Among BMI
groups, lower crude all-cause mortality was found among overweight 32.4% and obese
28.4% patients (p(probability) trend <0.001) compared to healthy weight participants.
Patients in higher weight categories also had a lower proportion of cardiovascular deaths
(overweight was 27% and obese 24.4% (p trend < 0.001) and worsening heart failure (overweight, 10.3% and obese 9.5% (p trend <0.001). In multivariable analysis, overweight and obese participants had lower all-cause mortality (overweight hazard ratio (HR) 88, 95% CI .80-.96; obese HR .81, 95% CI .72-.92) compared with healthy weight patients. The risk of death due to worsening heart failure for underweight and healthy weight was comparable. All-cause hospitalization and hospitalization due to worsening heart failure was similar across all BMI groups (p=.25 all-cause and p = .18 for heart failure hospitalization). At higher levels of BMI, all-cause mortality risk increased forming a U-shaped pattern similar to results found by Kapoor, et al. (2010). Both studies support evidence that obesity may be associated with lower risk of mortality at certain levels of BMI but also show that the risk of mortality actually increases for individuals at the extreme ends of the BMI spectrum.

In addition to study design, more work is also needed to understand how the obesity paradox may affect heart failure in the context of multiple comorbidities (Doehner, Clark, & Anker, 2010). A study (Adamopoulos et al., 2011), examining the obesity paradox among patients with diabetes and hypertension, found an obesity paradox was present in patients who were non-diabetic with heart failure but not those with diabetes. One hypothesis was that obesity may not be an independent predictor of mortality but its effects are rather mediated through diseases such as diabetes and hypertension. These issues add to existing questions regarding the best way to study the paradox.
**Issues with Understanding the Paradox**

The above studies illustrate how varying methods and designs used to examine the obesity paradox drive the difficulty in understanding the impact on heart failure mortality. Many obesity paradox studies use a retrospective design to obtain BMI and other study variables. Oftentimes, BMI is recorded only at baseline and changes in weight are not measured over time (Dickson et al., 2008; Kapoor & Heidenrich, 2010). This omission does not allow one to see changes in mortality risk as BMI status changes.

Although a standard measure of BMI has been developed, as shown in the previous studies, many researchers use different sources or methods to derive BMI cut-points making it harder to compare results. Further compounding the issue is the use of BMI as an accurate measure of adiposity. As indicated by Clark et al., 2012, waist circumference may also be useful in providing a more accurate depiction of the link between adiposity and heart failure mortality risk.

**Self-report Measures and BMI**

Self-report measures for BMI have been widely used as a means to capture anthropometric data among study populations when medical exams or measurements are not feasible. Although it provides an estimate of overweight and obesity, it can be subject to bias (Gillum & Sempos, 2005). Discrepancies in estimates of height and weight among different segments of the population can skew estimates of overweight and obesity. Overweight or obese individuals who participate in surveys and studies may be more likely to underestimate their weight than normal weight participants (Elgar & Stewart, 2008). In addition, sociodemographic factors such as gender may also affect the accuracy of self-reported data (Brunner, Chandola, & Marmot, 2007).
To identify and correct biases in data collected through self-report, two methods have been widely used. The first method involves using both self-report and height and weight from the same sample to compare differences in obesity prevalence. The second uses national population based surveys such as NHANES and BRFSS to assess differences in corrected estimates in BMI versus study measured BMI (John, Hanke, Grothues, & Thyrian, 2006; Miller et al., 2008; Zell, Kim, Olivero, Elgart, & Rabinovitz, 2008). The NHANES began the early 1960’s as a means to gauge the health and nutritional status of adults and children in the United States. It is one of few surveys that collects both self-report and measured anthropometric data (Centers for Disease Control [CDC], 2012). The BRFSS was started in 1984 as an on-going telephone health survey system that tracks health conditions and risk behaviors in the United States. Anthropometric data are collected through self-report (CDC, 2008).

Ezzati, Martin, Skjold, Vander Hoorn, and Murray (2006) examined population bias in self-report weight and height. Bias was assessed as a function of age, sex, mode of self-report to estimate unbiased trends in national and state levels of obesity. Population-level relationships between self-report height and weight were estimated using data from BRFSS and NHANES for years 1988-1994 and 1999-2002. The role of age and gender bias on self-report was also explored. Linear regression was used to correct for self-reported BMI. A separate regression analysis was conducted for measured BMI and adjusted for variables such as smoking, education, and age. Prevalence of obesity was estimated from the corrected BMI and compared with measured BMI. Sensitivity, specificity, and predictive values were used to measure the validity of the corrected BMI analysis. Findings showed that the mean differences
between measured and self-report weight was 1.6 kg. (95% CI 1.4, 1.8) in men and 1.8 kg in women (95% CI 1.6, 2.0). Differences in height were -0.3 cm for men (95% CI -0.5, -0.2) and -0.4 cm in women (95% CI -0.5, -0.2). Factors such as age and body size had the most impact on misreporting height, weight, and BMI for both sexes. For self-report data, the sensitivity of self-reported obesity was 70% in men and 82% in women. When adjusted for corrected self-report, it increased to 81% and 90% respectively. Specificity for self-report decreased from 99% in both sexes to 97% in men and 98% in women.

Shields, Gorber, and Tremblay, (2008) utilized a representative subsample from the Canadian Community Health Survey (n=4735) to estimate levels of obesity based on self-report versus direct measures of weight status. To assess potential biases, the difference between measured and self-report values was obtained. Separate analyses were conducted for men and women to determine differences by gender. Men were more likely than women to over-report height by one inch (-1.0, 95% CI -1.2, -0.8 vs. -0.6, 95% CI -0.7, -0.3 respectively). Females were more likely than men to underreport their weight. Levels of underreporting increased as BMI increased among females, with those who were obese most likely to underreport their weight (-0.8 95% CI -1.2, -0.4 vs. -2.8, 95% CI -4.7, -0.9 respectively). In multivariable analysis, the strongest predictor of a difference between self-report and measured weight was measured weight.

The studies above highlight statistical methods such as regression analysis that can be used to correct for BMI estimates obtained through self-report (Ezzati et al., 2006; Nyholm et al., 2007). Adjustments for factors such as age, gender, and race/ethnicity are also made using multiple linear regression to determine which factors affect self-report bias (Nyholm et al., 2007). A recent study by Jain (2010) also used regression models to
predict corrected height, weight, and obesity prevalence data using the BRFSS and
NHANES. Regression models were used to predict corrected height and weight from
NHANES data for years 1999-2006. The dependent variables in the regression model
included corrected height and weight. Independent variables included in the analysis
were age, gender, and race/ethnicity. Variables were excluded from the model if the
slope of the independent variable was not found to be significant ($\alpha = .05$). Next,
goodness of fit was determined by computing the percentage of predicted observations
lying within 5%, 10%, and >10% of the measured values. After models were fitted for
height and weight, corrected BMI was computed. Linear regression was then used to fit
for measured height and weight. Regression coefficients for height and weight were
applied to the BRFSS data to estimate corrected height and weight and BMI. Self-report
height for males was higher than corrected height by 2 cm and by 1 cm for females.
Over-reporting height increased with age. The prevalence of obesity based on self-report
was 4.5-5.8% lower than corrected rates for males and 4.4-5.1% lower for females.
Under-reporting of obesity increased with age. Based on the results, corrected height and
weight can be predicted using models presented in the study from a large data set that has
both measured and self-report data. Although the above studies examine population-
based data to correct for self-report bias, the methods may also be useful for smaller
studies.

**Cachexia**

Though excessive weight can be problematic among those with heart failure,
lower than normal weight can also be a negative prognostic factor. Cardiac cachexia is
defined as the depletion of metabolically active lean body mass. This loss of lean body
mass occurs as a result of advanced heart failure and is characterized by non-intentional severe loss of body weight, muscle wasting, fatigue and weakness. It is also associated with increased mortality among heart failure patients. Cardiac cachexia develops as a result of complications patients experience from progression of chronic diseases such as renal failure, chronic obstruction pulmonary disease (COPD) and heart failure (Evans et al., 2008). Weight loss resulting in cachexia can occur from a combination of inadequate protein intake, impaired nutrient absorption, and catabolic processes resulting from excessive nitrogen excretion, inadequate anabolism and physical inactivity (Kung, et al., 2012). Heart failure individuals with cachexia are generally weaker and fatigue sooner (Anker & Sharma, 2002). Rates of cachexia have been estimated to be between 8 and 15% in persons with heart failure with a New York Heart Association class II to IV (Riegel et al., 2009).

In the past, cardiac cachexia did not have standard classification or diagnostic guidelines. This made it difficult for researchers and clinicians to identify and treat patients appropriately. In 2008, a cachexia consensus conference was held in Washington, D.C. to develop guidelines for diagnosis and treatment options that can be used by both researchers and clinicians (Evans et al., 2008). Based on the consensus, individuals are diagnosed as cachectic if they display evidence of weight loss exceeding 5% within the past 12 months where weight loss cannot be documented and those with BMI \( \leq 20 \) kg/m\(^2\). In addition, a cachexia diagnosis relies on the presence of three of the five diagnostic criteria: 1) decreased muscle strength; 2) fatigue; 3) anorexia; 4) low fat-free mass index and 5) abnormal body chemistry due to inflammation, anemia or low serum albumin (Evans et al., 2008; Riegel et al., 2009).
Obesity paradox studies account for the potential influence of cachexia by either excluding these patients from initial analysis or conducting sensitivity analysis, which excludes these patients after they are included in the primary analysis. Patients who are cachectic are omitted from these studies due to issues such as severe unintentional weight loss and poor prognosis (Adampolous et al., 2011; von Haeling, Doehner, & Anker, 2011). There is a need for studies to explore the impact of cardiac cachexia and obesity on heart failure mortality.

**Summary**

Factors such as social support, heart failure knowledge, and the number of comorbidities affect heart failure self-care. A clinical understanding of obesity on heart failure provides a small view of its impact on the disease. There is a need to understand how heart failure influences health behaviors such as self-care. The current study was a secondary data analysis of baseline data obtained from three larger cross-sectional studies that examined the role weight status played in the uptake of self-care behaviors and the extent to which weight status strengthened or weakened the relationship between social support and heart failure self-care. The specific methodology for the study will be explained in the next section.
CHAPTER III

This dissertation was a secondary data analysis, which used baseline data obtained from three larger cross-sectional studies conducted among 736 African-American and Caucasian heart failure participants. The purpose of the dissertation was to understand the relationship of sociodemographic, clinical, and psychosocial factors with weight status and understand how weight status strengthened or weakened the relationship between heart failure self-care and social support. The first section of this chapter focuses on study design and handling missing participant information within the dataset. The second part focuses on measures used to collect main study variables (social support, heart failure self-care, BMI and heart failure sign and symptom knowledge) important to the study. A description of the creation of study variables used in the dissertation and analysis plan conclude the chapter.

Study Population and Procedures

The three studies in which baseline data were used for secondary analysis were as follows: 1) Social Support, Patient’s Needs and Hospital Use for Heart Failure (SSPAN-HF); 2) Social Support, Self-Management and Hospital Use for Heart Failure (Druid City Hospital Social Support Study; DCH-SSS); and 3) Pilot for Understanding Hospital Use for Heart Failure (PUSSH). The collective purpose of these studies was to elucidate relationships among social support, self-care behaviors, and hospital use among a local population of persons with heart failure. Participants were recruited from three hospitals: two in Birmingham, Alabama (1 teaching and 1 safety-net) and one regional referral center in Tuscaloosa, Alabama. Participants recruited from the teaching hospital and
regional referral center were eligible to be included in the study if they were diagnosed with heart failure by diagnostic coding (International Classification for Diseases (ICD)-9th Edition or Diagnosis Related Group (DRG) code) from inpatient administrative data spanning from January 1, 2006 to January 1, 2009. Physician referral based on known heart failure diagnosis was used to recruit participants at the safety-net hospital. Table 1 outlines the inclusion and exclusion criteria for each study.

**Dataset and Missing Data**

Seven hundred thirty-six (736) patients were included in the original dataset. Of those, 690 (94%) were included in the dissertation analysis. Figure 3 outlines the sequential process used to exclude participants with missing response data, < 40 years and BMI < 18.5 kg/m².

The MISSING function in SAS was used to create a modified version of each variable to identify which patients had missing observations. Next, the NMISS function was used to generate frequency tables for each variable using PROC FREQ to determine how many missing were found for each observation. Frequency output was coded 0= missing and 1= non-missing for each study variable. Based on the output, 8 study variables were found to have missing observations.

To eliminate participants with missing observations, the eight variables were ordered starting with the highest number of missing observations. Code was then written in SAS to eliminate participants with missing observations. A frequency count was generated after each elimination to confirm all participants with missing observations were excluded before proceeding and repeated for each variable. A final frequency table
was generated for all variables to confirm no missing observations remained. Lastly, participants with BMI < 18.5kg/m² were excluded from the dataset.

**Measures**

Baseline data was collected using a mixture of in-person (safety-net hospital) and telephone interviews (teaching hospital and regional referral center). Sociodemographic variables such as age, gender, and income were used to provide a descriptive overview of participants in the study and determine the relationship of each of these characteristics with heart failure self-care. Clinical factors such as number of comorbidities were included to gain insight into the distribution of disease burden by weight status. Psychosocial factors such as perceived social support were included in analysis to assess the relationship of these factors with self-care behaviors. This dissertation examined the relationships among sociodemographic, clinical, and psychosocial factors with weight status and heart failure self-care. Table 2 provides a brief description of the main instruments used to collect study data regarding heart failure self-care, social support and heart failure self-care knowledge and associated reliability scores. A copy of the survey used to collect the data found in this dissertation is included in the appendix (page 115).

**Sociodemographics**

Variables such as age (year of birth), race, ethnicity, gender, income (<$20,000; 20,000-$39,999; $40,000-$59,999; $60,000 - $79,999; > $80,000), education (less than high school; graduated high school; some college; college graduate; professional or graduate school completed), and marital status were used to provide a descriptive overview of the study population. Within the context of heart failure, variables such as age may not be evenly distributed because the disease mainly affects patients who are
middle-aged and older. As such, the type of social support needed may differ based on age as well as the effect of low levels of perceived social support on health outcomes (Murray et al., 2004; Paukert, LeMaire, & Cully, 2009). The inclusion of variables such as race and gender provided insight into self-care barriers that may be specific to particular subgroups.

**Social Support**

Social support was measured using the 19-item Medical Outcomes Study Social Support Scale (MOS-SSS). The multidimensional scale was developed for administration to chronically ill patients participating in the two-year Medical Outcomes Study and was administered to 2,987 patients ages 18 and older (Sherbourne & Stewart, 1991). The questions covered 4 areas of social support: emotional/informational, instrumental (tangible), affectionate, and positive social interaction (RAND Health, 2010). Reliability scores for each subscale are listed in Table 2. Responses for each item were on a 7-point likert scale ranging from 1 “none of the time” to 7 “all of the time” (Sherbourne & Stewart, 1991). Higher scores for each subscale indicated higher levels of support.

For each subscale, a score was obtained by calculating the average of scores for each item in that particular section. The overall support scale was scored by calculating the average of scores for all 18 items included in the subscale and the score for one additional item on the survey. For comparison purposes, scale scores can be transformed to a 0-100 scale (RAND Health, 2010). Example questions from the emotional/informational and tangible scale included: “Someone you can count on to listen to you when you need to talk?” and “Someone to help you if you were confined to bed?”
An example from the tangible and affectionate support scale included: “Someone to help you if you were confined to bed?” and “Someone who hugs you?” Examples of statement from the multidimensional perceived social support scale included the following: “There is a special person who is around when you are in need.” and “Your family really tries to help you.”

Self-care Knowledge

Self-care knowledge was analyzed using the DeWalt Knowledge of Chronic Heart Failure questionnaire, which assessed a participant’s knowledge of heart failure signs and symptoms (DeWalt, et al., 2004). The authors developed and pilot tested the 5-item scale during a 3-month before-and-after study among heart failure patients with low literacy skills. Educational materials were also created to assist in the development of disease management programs. Questions were administered to patients (n= 25; mean age 60) during focus group sessions to test the effectiveness of education materials. Items are written in true/false and multiple choice formats. One point is assigned for each correct item response with scores ranging from 0 to 15. Higher scores indicate greater knowledge of heart failure signs and symptoms. Examples of questions that assessed knowledge included “What should you do when your legs swell up more than normal? Is yellowing of the skin a sign your heart failure is getting worse?”, “Is shortness of breath a sign your heart failure is getting worse?”. Based on the distribution of scale scores, a cutoff can be identified (e.g. lowest quantile) and an individual’s knowledge level can be categorized as high or low (DeWalt et al., 2004).
**Heart Failure Self-care**

Heart failure self-care was assessed using the Riegel Heart Failure Self-care Index (Riegel et al., 2004). The 15-item scale was divided into three subtypes of self-care maintenance, self-care management and self-care confidence. Maintenance measured an individual’s ability to perform self-care behaviors such as daily weights and eating a low sodium diet. Management measured the likelihood of using remedies to treat worsening heart failure symptoms. Self-care confidence measured individuals’ confidence in their ability to manage their heart failure symptoms.

Items were rated on a 4-point response scale. The scale was scored continuously from 0 to 300 with higher scores indicating higher self-care practices. Testing of the scale was conducted with a group of (n=760) heart failure patients located in seven sites throughout the United States. Construct validity was supported with significant total and subscale differences between patients who were newly diagnosed and those who have had the condition. An example of questions on the survey included: “How confident are you that you can evaluate the importance of your own symptoms? How often do you…. Weigh yourself daily? Eat a low sodium diet?”

The self-care scale has recently been revised to include added items, refined responses for self-care maintenance and modified responses on how to use scales (Riegel et al., 2009). The overall definition of self-care, administration, and ordinal responses of the scale remained unchanged. As a result, scores from the previous version (which were used in this dissertation analysis) were comparable to the current scale. Updated recommendations for use of the scales placed greater emphasis on using each scale separately to access patient self-care levels. Self-care confidence was advised to be
assessed as a potential moderator of the relationship between other factors and self-care rather than a component of actual self-care. A cut-point of $>70$ on each of the three subscales ($\geq 210$ total self-care) was found to adequately judge patients as having adequate or inadequate levels of self-care. Based on the revised recommendations, self-care confidence was not used to measure participant’s self-efficacy in the dissertation analysis. Instead, self-efficacy was assessed using a component of the Kansas City Cardiomyopathy Questionnaire.

**Kansas City Cardiomyopathy Questionnaire (Self-efficacy)**

The Kansas City Cardiomyopathy Questionnaire (KCCQ) was used to assess functional status and severity of heart failure (Green, Porter, Bresnaham, & Spertus, 2000). The questionnaire was developed through review of medical literature, examination of available HRQoL instruments, focus groups with heart failure patients and chronic heart failure specialists. There were seven domains within the questionnaire which encompassed physical limitations, symptoms, severity and change over time, self-efficacy and knowledge, social interference and quality of life. The construct of self-efficacy was used in this dissertation. Two questions on the scale measured self-efficacy using a likert scale response. The questions measured if a person knew what to do, or whom to call if their heart failure worsened and how well patients understood what to do to keep their heart failure symptoms from getting worse.

Patients were divided into reliability and responsiveness cohorts. The reliability cohort consisted of patients who remained stable, were not hospitalized and did not change medications during the testing period. Patients in the responsiveness cohort were selected because their clinical status would change. Test-retest reliability was conducted
with paired t-tests which analyzed 3-month change in scores among patients retained in the reliability cohort (n=70). Responsiveness of questionnaires to clinical change was measured using paired t-tests among patients in the responsiveness cohort (n=39). Correlation and independent two sample t-tests were used to validate each questionnaire domain. Internal consistency for each domain yielded the following Cronbach’s alpha: physical limitation (.90), symptoms (.88), quality of life (.78), social limitation (.86), self-efficacy (.62), KCCQ functional status (.93) and KCCQ clinical summary (.95).

Responses to the questions within each domain were constructed using a likert scale. Scores ranged from 0 to 100, with higher scores indicating lower severity.

At the time the questionnaire was developed, the authors noted that there was no validated measure that quantitatively summarized information regarding self-efficacy. As such, it was suggested that acceptance of the domain could be made on face validity of reliability and responsiveness cohorts. Comparisons were made between stable heart failure patients and those who had been admitted to the hospital with decomposed symptoms. Self-efficacy mean score was significantly lower for those who were admitted to the hospital versus patients with stable heart failure in the reliability cohort (67.6 vs. 83.5; p value <0.0001). In the responsiveness cohort, self-efficacy scores improved significantly after follow-up (67.6 vs. 83.0; p <0.001).

**Body Mass Index**

Current studies and the healthcare settings use body mass index as means of classifying patients as normal, overweight, and obese. Classifications were based on those used by the National Heart Lung and Blood Institute (NHLBI) which defined underweight as BMI <18.5 kg/m², normal weight as BMI 18.5-24.9 kg/m², overweight as
BMI 25.0-29.9 kg/m² and obese as BMI ≥ 30 kg/m² (NHLBI, 2000). Height (feet and inches) and weight (pounds) from previously collected self-reported baseline data were used in calculating BMI. The formula used to calculate BMI was weight in kilograms divided by height in meters squared (kg/m²) with metric conversions for recorded height and weight. Based on BMI, weight status was classified as normal weight, overweight or obese.

**Variable Creation**

The purpose of Specific Aim 1 was to understand the relationship among sociodemographic, clinical, and psychosocial factors with weight status among a baseline sample of African-American and Caucasian heart failure participants. The primary dependent variable associated with specific Aim 1 was BMI. This variable was created as outlined in the measures section. All analysis excluded participants with BMI < 18.5 kg/m² which eliminated potential confounding due to cardiac cachexia.

Primary independent variables associated with this aim were gender, race, perceived social support and heart failure self-care knowledge. Male and female gender were used in the analysis. Race was recorded and analyzed in categories of African-American or Caucasian. Previous descriptive analysis showed perceived social support was not normally distributed (right skewed). To minimize bias created by the skew, the interquartile range was used to derive three categories: low (bottom 25ᵗʰ percentile) moderate (distance between 25ᵗʰ and 75ᵗʰ percentile) and high social support (75ᵗʰ percentile). This measure was based on self-report data from the MOS-SSS (page 41). Self-care knowledge was divided into categories of high (75ᵗʰ percentile) vs. low (bottom 3 quartiles). This measure was based on the DeWalt Knowledge of Heart Failure Scale
Age was analyzed as a continuous variable. The four hypotheses and analyses associated with this specific aim are listed below.

The purpose of Specific Aim 2 was to measure the impact of weight status on the relationship between perceived social support and heart failure self-care for among African-American and Caucasian heart failure participants. The primary dependent variable associated with this aim was heart failure self-care, which was dichotomized into categories of adequate vs. inadequate based on recommendations from Riegel et al. (2009). For the total self-care score a cut point of 210 was used to classify participants as having adequate (total score ≥ 210) and inadequate (total score < 210) self-care. For self-care maintenance and management a subscale score of 70 was used to dichotomize each variable as adequate (subscale score ≥70) or inadequate (subscale score <70).

BMI and perceived social support were the primary dependent variables associated with specific aim 2.. They were analyzed as categorical variables using the same classification methods outlined within Specific Aim 1. Also in this aim, BMI was assessed as an effect modifier, to determine if it strengthened or weakened relationship between perceived social support and heart failure self-care.

Additional independent variables were also included in the analysis to gain a more in-depth understanding of factors that affected heat failure self-care and how they were related to weight status. These variables included length of time since the diagnosis of heart failure, heart failure severity score, type of doctor seen for heart failure, self-efficacy for heart failure self-care, depression, and trust in physician score. Mean score and standard deviation were used to report heart failure severity score, self-efficacy for heart failure, and trust in physician score. A frequencies count was used to identify the
number and percentage of participants based on gender, race, household income, educational attainment, marital status, insurance status, BMI, length of time since heart failure diagnosis, hospital type, primary care physician for heart failure, depression, total perceived social support score and low heart failure knowledge.

**Analysis Plan.**

All analyses were conducted using SAS ® version 9.3. All data were de-identified and reported in aggregate to protect the confidentiality of participants’ response data.

**Specific Aim 1**

Descriptive statistics (mean, standard deviation, number and percentage) were conducted for all independent sociodemographic, clinical and psychosocial variables. Chi-square analysis (categorical) or ANOVA (continuous) tests were then used to assess significant differences in proportions and means of the independent variables categorized weight status groups of normal weight, overweight and obese. A p-value less than 0.05 was used to indicate statistical significance for aforementioned statistical tests. Outlined below were the specific analyses for each study hypothesis.

**Hypothesis 1a:** The first hypothesis stated female heart failure participants would be more likely to be overweight or obese than male heart failure participants. Descriptive statistics were used to present the number and percentage of males and females represented in the study sample. Additionally, a chi-square test was performed to determine if there were significant differences in the proportion of male and female patients based on BMI category.
**Hypothesis 1b:** The second hypothesis stated African-American heart failure participants would be more likely to be overweight or obese than Caucasian heart failure participants. Similar to hypothesis 1a, descriptive statistics were used to present the number and percentage of African-American and Caucasian heart failure participants in the study sample. A chi-square test was then performed to assess differences in proportion of participants who were classified as normal weight, overweight or obese based on race.

**Hypothesis 1c:** The third hypothesis stated participants with lower levels of perceived social support would be more likely to be overweight or obese than those with moderate or high levels of perceived social support. Social support was divided into categories of low, moderate and high. The number and percentage of participants in each category were presented in descriptive statistics. For this hypothesis, a chi-square test was performed to assess differences in the proportion of participants who were classified as normal weight, overweight, or obese based on low, moderate and high levels of perceived social support.

**Hypothesis 1d:** The final hypothesis stated participants with lower heart failure self-care knowledge would be more likely to be overweight or obese than those with high levels of heart failure self-care knowledge. First, the number and percentage of participants categorized with low and high levels of heart failure knowledge were calculated. Then, a chi-square test was performed to assess differences in the proportion of participants who were classified as normal weight, overweight, or obese based on levels of heart failure self-care knowledge.
Cumulative logistic regression was performed to assess the unadjusted association of each study characteristic (independent variable) with the primary dependent variable (BMI category). Cumulative logistic regression was chosen because the dependent variable (BMI category) was a categorized ordinal outcome with three classes. Finally, all independent variables were included in an adjusted regression to model the odds of heavier weight based on study sociodemographic, clinical, and psychosocial characteristics.

Specific Aim 2

Similar to Aim 1 chi-square analysis (categorical) or ANOVA (continuous) tests were used to detect significant differences among independent variables based on (primary dependent variables) total self-care, maintenance and management scores. Unless otherwise noted, statistical significance level (Type I error), $\alpha$, was 0.05 for statistical tests. Outlined below were the specific analyses for each study hypothesis.

Hypotheses 2a-2c: Overweight or obese participants with heart failure would have lower self-care compared to those of normal weight. Chi-square tests were used to assess differences in proportion of participants who are normal weight, overweight or obese by adequate or inadequate levels of total self-care. The same procedure was repeated for self-care maintenance and management.

Unadjusted logistic regression was used to determine if there was an association between weight status and heart failure self-care. The logistic regression model was used because self-care was a binary outcome divided into categories of adequate and inadequate. The independent association of obesity with heart failure total self-care was assessed by including all covariates in the model. The odds of inadequate total self-care
were modeled for both unadjusted and adjusted logistic regression. The same statistical process was conducted for self-care management, and maintenance.

**Hypothesis 2d:** To determine whether obesity strengthened or weakened the relationship between perceived social support and heart failure self-care an interaction, term of BMI and perceived social support was created and included in adjusted models for total self-care, management, and maintenance. A p-value threshold less than 0.1 was used to indicate whether stratification of adjusted models for total self-care, management, and maintenance by BMI category was warranted.
CHAPTER IV
RESULTS

This chapter presents results based on methodology outlined in the previous chapter. There were two specific aims associated with this study. The first aim was to understand the relationship of sociodemographic, clinical, and psychosocial factors with weight status (using body mass index) in a sample of African-American and Caucasian heart failure participants. Chi-square test was used to assess differences in proportion and ANOVA test to detect differences in mean scores based on weight status. Unadjusted and adjusted cumulative regression models were performed to estimate the odds of being heavier for each independent variable. An adjusted cumulative regression model was used to explain the association of all the independent variables on the odds of being heavier. The second aim was to assess the relationship between weight status and heart failure self-care among a baseline sample of African-American and Caucasian heart failure participants. Chi-square test was used to assess differences in proportions and means and ANOVA for differences in mean based on self-care categories. Unadjusted and adjusted logistic regression models were performed to estimate the odds of inadequate total self-care, self-care maintenance, and self-care management. To determine if different categories of BMI strengthened or weakened the relationship between social support and self-care, an interaction term was created and a threshold set to justify stratification based on BMI. Each section presents findings for each specific aim and associated hypothesis. The chapter will conclude with a summary of findings.
**Specific Aim 1**

The first specific aim was to understand the relationships of sociodemographic, clinical, and psychosocial factors with weight status (using body mass index) in a sample of African-American and Caucasian heart failure participants.

A total of 690 patients were used in the baseline analysis. BMI was used to divide participants into categories of normal weight (>18.5 – 24.9 kg/m²), overweight (≥ 25.0 - 29.9 kg/m²) and obese (≥ 30 kg/m²). Based on this, there were (n= 154) normal weight, (n= 197) overweight and (n= 339) obese participants. There were a higher proportion of females than males (54% female vs. 45% male) in the sample. The sample also included a higher proportion of African-American (66%) participants. Baseline measures of sociodemographic, clinical and psychosocial factors then stratified by body mass index and are presented in Table 3.

Age was found to be highly associated with BMI category (p = <.0001). Mean age decreased across normal (67 ± 12), overweight (64 ± 12) and obese (60 ± 11) categories. A greater percentage of normal weight participants (42%) were married compared to obese patients (39%) and this difference was statistically significant (p=0.01). Income was also highly associated with weight status. The proportions of those participants having incomes <$20,000 increased with increasing weight (53% vs. 59% vs. 74% among normal, overweight and obese groups respectively, p=0.0004).

Obese participants had the highest number of (p= 0.0004) comorbidities compared to normal weight participants (5 ± 2 vs. 4 ± 2 respectively; p = <.0001). For
heart failure severity score (p= <0.0001), where higher mean scores indicate less severe heart failure, normal weight participants had the highest mean score (64 ± 23) while obese participants had the lowest (55 ± 24). Heart failure sign and symptom knowledge was the only psychosocial factor associated with BMI (p= 0.01). As weight status increased for heart failure sign and symptom knowledge, the proportion of participants in the low knowledge category decreased from 87% to 80% to 75% among those normal weight, overweight, and obese groups respectively.

Hypothesis 1a: Female heart failure participants would be more likely to be overweight or obese than male heart failure participants.

There was a significant difference in BMI based on gender (p= 0.001, Table 3). The distribution in participants in the normal weight category was the same. In the overweight category, there were a greater proportion of males than females (45% female vs. 55% male). Within the obese category, there were a greater proportion of women than men (61% women vs. 39% men respectively).

Hypothesis 1b: African-American heart failure participants would be more likely to be overweight or obese than Caucasian heart failure participants.

There were significant differences in levels of body mass index between Caucasian and African-American heart failure participants (p= 0.02, Table 3). For both groups, the number of participants in each group increased as levels of BMI increased. However, this increase was the most pronounced among African-American participants. The greatest difference in the proportion between African-American and Caucasian participants was observed in the obese category (70% African-American vs. 30%...
Caucasian). Similar to gender, a pronounced increase from the overweight to obese category was observed for both races.

**Hypothesis 1c:** Participants with lower levels of perceived social support would be more likely to be overweight or obese than those with moderate or high levels of social support.

The difference in the proportions of participants in each social support category based on BMI was not significant (p = 0.40, Figure 4).

**Hypothesis 1d:** Overweight and obese heart failure participants will have lower knowledge of heart failure self-care than those of normal weight.

There was a significant (p= 0.01, Figure 5) decrease in the proportion of participants with low levels of heart failure knowledge. Increased BMI category (87% normal weight, 80% overweight and 75 % obese) was associated with lower heart failure knowledge scores.

**Total Self-care and Weight Status**

The differences in proportions of participants with low total self-care scores by BMI category was not statistically significant (p= 0.50).

**Associations of Weight Status with Baseline Characteristics among Heart Failure Patients**

Table 4 presents unadjusted and adjusted logistic regression model results for the outcome of weight status (normal weight, overweight and obese). The model predicted the odds of higher weight based on sociodemographic, clinical and psychosocial characteristics but the table presents only clinical and psychosocial factors for both
unadjusted and adjusted logistic regression. The multivariable regression model was adjusted by age, race, income, education, marital status, insurance status, length of time with heart failure diagnosis, depression, hospital type, insurance status, number of comorbidities, heart failure severity, heart failure self-efficacy, type of doctor, social support, trust in physicians, and heart failure sign and symptom knowledge.

There were multiple clinical factors including, participant recruitment from safety-net hospitals and type of doctor associated with an increase in odds of higher weight. Length of time since heart failure diagnosis was associated with an increase in the odds of higher weight. Odds of higher weight were greatest for those diagnosed with heart failure 1-3 years (OR 1.52, 95% CI 1.01, 2.30) and >5 years (OR 1.64, 95% CI 1.11, 2.44). Participants recruited from the regional referral center (OR 1.50, 95% CI 1.10, 2.03) were associated with an increase in odds of higher weight. With each additional comorbidity, the odds of higher weight increased by 30% (OR 1.3; 95% CI, 1.20, 1.35). For the KCCQ overall summary score, a one unit increase in mean score was associated with a 1% decrease in the odds of higher weight (OR 0.99, 95% CI 0.98, 0.99). Low heart failure sign and symptom knowledge was associated with a (OR 1.73, 95% CI, 1.21, 2.50) increase in the odds of higher weight. Depression was associated with a 40% increase in odds of higher weight (OR 1.4; 95% CI 1.02, 1.81).

In the adjusted analysis, receiving care at a regional referral center, the number of comorbidities, moderate social support and low failure knowledge increased odds of higher weight. As in the unadjusted analysis, participants recruited from the regional referral center were associated with a 1.50 increase in odds of higher weight (95% CI 1.10. 2.13) compared to those recruited from the teaching hospital. Each additional
comorbidity was associated with 1.24 increase in the odds of higher weight (95% CI 1.15, 1.30). Participants who were categorized with moderate perceived social support was associated with a decrease in the odds of low total self-care by 30% (OR 0.70, 95% CI, 0.50, 0.98) compared to those with low perceived social support. Low heart failure knowledge was associated with an increase in the odds of higher weight (OR 1.54; 95% CI 1.03, 2.31).

Specific Aim 2

The second specific aim was to assess the relationship between weight status and heart failure self-care among a baseline sample of African-American and Caucasian heart failure participants.

Hypothesis 2a: Overweight or obese participants with heart failure will have lower levels of total self-care compared to those of normal weight

Hypothesis 2b: Overweight or obese participants with heart failure will have lower levels of self-care maintenance compared to those of normal weight

Hypothesis 2c: Overweight or obese participants with heart failure will have lower levels of self-care management compared to those of normal weight

For Specific Aim 2, there were 480 participants categorized as having inadequate total self-care and 210 categorized with adequate total self-care scores. There were 441 participants classified with inadequate self-care maintenance and 249 with adequate self-care maintenance. For self-care management, there were 424 classified as having inadequate scores and 266 as having adequate scores. Table 5 presents an overview of sociodemographic, clinical, and psychosocial factors stratified by self-care total score.
Tables 6 and 7 present an overview of these factors by stratified self-care maintenance and self-care management respectively. Chi-square and ANOVA tests were used to test differences in proportions and means.

**Total Self-care**

Income was significantly associated with total self-care (p=0.03). The number of participants in each total self-care category decreased as income levels increased except for the highest category. A higher proportion of participants were poor among those with inadequate self-care compared to those with adequate self-care (66% vs. 57%; p=0.08) Marital status was also associated with total self-care category. A higher proportion of participants were married among those with inadequate self-care compared to those with adequate self-care (50% vs. 40% p= 0.02).

In terms of clinical factors, length of time with heart failure diagnosis and heart failure severity score were related to total self-care. The proportion of participants with adequate total self-care score increased as the length of time with heart failure diagnosis increased (p=0.046). Participants with inadequate total self-care scores had lower heart failure severity scores compared to those in the adequate category (57 ± 24 vs. 63 ± 24 respectively; p= 0.01). A lower mean score among patients in the inadequate total self-care category indicated more severity.

All psychosocial factors were statistically associated with adequate and inadequate total self-care. In terms of self-efficacy score, again participants with inadequate self-care scores had lower mean scores than those in the high self-care category (72 ± 25 vs. 88 ± 17 respectively; p= <0.0001). There was a higher proportion of depressed participants (p= 0.049) with inadequate total self-care n= 231 (48%) scores
than those categorized as adequate n=84 (40%). In terms of social support, for those in the inadequate category, the highest proportion of participants was in the low category (36% low vs. 33% moderate vs. 31% high). For those in the adequate total self-care category, the greatest proportion of participants were in the high category (49%). The association of social support and total self-care category was highly significant p= <0.0001. Higher mean trust in physician scores were reported among those with adequate total self-care (74 ± 13; p= 0.003). A higher proportion of participants had low heart failure knowledge among those with inadequate total self-care compared to those with adequate self-care (84% vs. 67%; p= <0.0001). The difference in BMI category based on total self-care category was not significant (p= 0.49).

**Self-care Maintenance**

Mean age for participants with adequate self-care maintenance was higher compared to those with inadequate and the total mean age (65 ± 12 vs. 61 ± 12; p= <0.0001). There were a higher proportion of insured participants with adequate self-care compared to those with inadequate self-care (95% vs. 90%; = p 0.05). Body mass index was significantly related to self-care maintenance scores (p= 0.002). Hospital type was also associated with self-care maintenance scores (p= 0.01). For the regional referral center and teaching hospital, the proportion of participants in the adequate self-care maintenance category (35% regional referral center vs. 52% teaching hospital) was larger compared to the inadequate category (29% regional referral center vs. 48% teaching hospital). For the safety-net hospital, however, there were a greater proportion of patients in the inadequate category (13% adequate vs. 23 % inadequate). Mean heart failure severity scores were lower for those with inadequate maintenance scores (56 ± 22 vs. 63
± 25; p = 0.0002, respectively) which indicated more severity among participants in the inadequate category. A higher proportion of participants with inadequate self-care maintenance scores visited a primary care physician compared to those with adequate levels (59% vs. 45%; p= 0.0003).

All psychosocial factors except low heart failure knowledge were related to self-care maintenance scores. Mean self-efficacy scores were higher for participants with adequate self-care maintenance scores (82 ± 20 vs. 74 ± 25 respectively; p=<0.0001). A greater proportion of depressed participants were in the inadequate self-care maintenance category compared to those with adequate self-care maintenance category (51% vs. 37%; p=0.01). Social support (p= 0.001) followed a U-shaped pattern with the highest proportion of participants for each category of self-care maintenance in the middle category for the adequate category. There was a greater proportion of participants categorized as having high social support with adequate self-care maintenance scores (43%) compared to those with inadequate scores (32%).

**Self-care Management**

Age and household income were related to self-care management. Participants with inadequate self-care management scores had a higher mean age compared to those with adequate scores (64 ± 12 vs. 61 ± 11; p= <0.0001). Length of time with heart failure diagnosis (p=0.002), and number of comorbidities (0.003) were clinical factors significantly associated with self-care management category. In terms of length of time for heart failure diagnosis, the greatest proportion of participants for both groups was found in the >5 year category (33% inadequate vs. 35% adequate) Interestingly, the
mean number of comorbidities in the adequate category was greater than those in the inadequate category (5.2 ± 2 vs. 4.6 ± 2).

Trust in physicians score (p= 0.02) low heart failure knowledge (p=<0.0001), and self-efficacy score (p = <0.0001) were psychosocial factors significantly associated with self-care management scores. Participants in the adequate category also had higher mean self-efficacy scores (83 ± 20 vs. 73 ± 25 respectively). Physician trust mean scores were greatest among those in the adequate score group (73 ± 12). In terms of self-care knowledge, only (68%) of patients in the adequate category were categorized as having low knowledge whereas (86%) were found in the inadequate category. Body mass index was not statistically associated with self-care management category (p =0.34).

**Regression Analysis**

Table 8 presents unadjusted and adjusted logistic regression results for baseline clinical and psychosocial characteristics with total self-care score. The analyses modeled the odds of lower total self-care based on sociodemographic, clinical and psychosocial characteristics. Similar unadjusted and adjusted analyses were also conducted to model the odds of inadequate self-care maintenance and self-care management with results presented in Tables 9 and 10. All multivariable models are adjusted by age, race, income, education, marital status, insurance status, length of time with heart failure diagnosis, depression, hospital type, insurance status, number of comorbidities, heart failure severity, heart failure self-efficacy, type of doctor, social support, trust in physicians, and heart failure sign and symptom knowledge.
**Total Self-care**

In unadjusted analysis, the only clinical factor statistically associated with inadequate total self-care was heart failure severity score. A one unit increase in the severity score was associated with a 1% decrease in the odds of inadequate total self-care (OR 0.99, 95% CI 0.98, 0.99). Among psychosocial factors heart failure self-efficacy, high social support, trust in physicians, medication adherence, and high heart failure knowledge were associated with inadequate total-self care. A 1-point increase in mean self-efficacy score was associated with a 4% decrease in the odds of inadequate total self-care (OR 0.96, 95% CI 0.95, 0.97). There was a significant association of decrease in odds in low total self-care and social support for both moderate and high categories. Participants who were categorized with high perceived social support was associated with a decrease in the odds of inadequate total self-care by 60% and 39% for those categorized with moderate perceived social support (OR 0.40, 95% CI, 0.23, 0.54 vs. OR 0.61, 95% CI 0.40, 0.95, respectively) compared to those with low perceived social support. A one-point increase in physician trust score was associated with a 2% decrease in the odds of low total self-care. Compared to those with low levels of health care knowledge, having high levels of knowledge was associated with a 60% decrease in the odds of inadequately total self-care score.

In adjusted analysis, self-efficacy, high perceived social support and high levels of self-care knowledge were associated with a decrease in odds of inadequate total self-care. A one unit increase in self-efficacy score was associated with a 3% decrease in the odds of inadequate self-care (OR 0.97, 95% CI 0.96, 0.98). Compared to participants with low levels of perceived social support, having high level of perceived social support
was associated with a 40% decrease in the odds (OR 0.60, 95% CI 0.40, 0.94) of inadequate total self-care. Compared to participants categorized as having low knowledge levels, participants with high knowledge were associated with a 50% decrease in the odds of inadequate self-care (OR 0.50, 95% CI 0.30, 0.72). Body mass index was not statistically associated with odds of lower total self-care score for either the unadjusted or adjusted regression models. However, there was a trend toward increase in the odds of inadequate self-care total score based on increase in BMI category.

**Self-care Maintenance**

In unadjusted analysis, clinical factors such as body mass index (obese), hospital type, heart failure severity, and type of doctor were associated with inadequate self-care maintenance. Being obese was associated with a slightly higher than 100% increase in odds (OR 2.01, 95% CI 1.40, 3.00) for inadequate self-care maintenance compared to those who were normal weight. Participants recruited from a safety-net hospital had a higher odds of having of inadequate self-care maintenance (OR 1.90, 95% CI 1.21, 2.98) compared to those recruited from a teaching hospital. A 1-point increase in heart failure severity score was associated with a 1% decrease in odds of inadequate self-care maintenance. Compared to those who saw a primary care physician, participants seeing a cardiologist for their heart failure was associated with a 40% decrease in odds (OR 0.60, 95% CI 0.41, 0.80) of inadequate self-care maintenance. Psychosocial factors such as heart failure self-efficacy, depression, high social support and physician trust score were statistically associated with inadequate self-care maintenance score. A 1-point increase in self-efficacy score was associated with a 2% decrease in odds of inadequate self-care maintenance (OR 0.98, 95% CI 0.98, 0.99). Depression had an adverse effect on self-
care maintenance with depressed participants being 1.80 times more likely to have poor self-care maintenance scores (95% CI 1.30, 2.40). Moderate and high perceived social support was associated with a decrease in odds of inadequate self-care maintenance. Participants who were categorized with high perceived social support was associated with a decrease in the odds of inadequate total self-care by 50% and 36% for those categorized with moderate perceived social support (OR 0.50, 95% CI, 0.33, 0.73 vs. OR 0.64, 95% CI 0.43, 0.96, respectively) compared to those with low perceived social support. A 1-point increase in trust in physician score was associated with a 2% decrease of an inadequate maintenance score.

In adjusted analysis, obesity was statistically associated with an increase in odds of inadequate self-care maintenance scores (OR 1.70, 95% CI 1.10, 2.64) compared to normal weight. Participants who saw a cardiologist for their heart failure had a 30% decrease in odds of inadequate self-care maintenance scores (OR 0.70, 95% CI 0.50, 0.99). Heart failure self-efficacy was the only psychosocial factor associated with low self-care maintenance in the adjusted analysis. A one-point increase in self-efficacy score lead to a 1% decrease in odds of inadequate self-care maintenance.

**Self-care Management**

In the unadjusted analysis, clinical factors such as length of time with heart failure diagnosis and number of comorbidities were statistically associated with inadequate self-care management. Compared to those with less than one year of diagnosed heart failure, those with 3-5 years experienced a 59% (OR 0.41, 0.30, 0.70) decrease in the odds of inadequate self-care management while those with 5 or more years experienced a 38% decrease (OR 0.62, 95% CI 0.40, 0.98). Although all lengths of time led to a decrease in
odds of low self-management, the greatest decrease was seen between 3-5 years. With each additional comorbidity, the odds of inadequate self-care management decreased by 10% (OR 0.90, 95% CI 0.82, 0.96).

Heart failure self-efficacy, social support (high), physician trust and heart failure knowledge were all psychosocial factors related to odds of inadequate self-care management in unadjusted analysis. A 1-point increase in self-efficacy score was associated with a 2% decrease in the odds of inadequate self-care management (OR 0.98, 95% CI, 0.97, 0.99). For participants with high social support, there was a 30% decrease in odds (OR 0.70, 95% CI, 0.50, 0.98). Trust in physician mean score lead to a 1% decrease in odds of inadequate management score (OR 0.99, 95% CI 0.97, 0.99). Compared to those with low levels of heart failure sign and symptom knowledge, those in the high category had a 66% decrease in odds of inadequate self-care management (OR 0.34, 95% CI 0.24, 0.50).

In adjusted analysis length of time with heart failure diagnosis, number of comorbidities and self-efficacy were associated with inadequate self-care management. Participants who had heart failure 3-5 years saw a 50% decrease in the odds of inadequate self-care management (OR 0.50, 95% CI 0.30, 0.80). This was the only category of length of time with heart failure diagnosis that was significant. As mean number of comorbidities increased, the odds of inadequate self-care management decreased by 10% (OR 0.90, 95% CI 0.81, 0.98). As self-efficacy score increased there was a 2% decrease in odds of inadequate self-care management (OR, 0.98, 95% CI 0.97, 0.99). Heart failure knowledge was the only psychosocial factor associated with odds of inadequate management score. Participants in the high knowledge category had 50%
lower odds of inadequate self-care management (OR 0.50, 95% CI 0.31, 0.73) compared to those with low heart failure knowledge.

**Self-care Maintenance: A Closer Examination of its Association with Weight Status**

Because of the significant trend in lower self-care maintenance with increasing BMI category, a more detailed analysis was conducted to determine which specific self-care behaviors drives the association. A total of 690 participants were used in the analysis. More participants in the analysis were found in the obese category (n= 343) than normal weight (n=154) or overweight (n=197).

Within the Reigel heart failure self-care index, five questions were developed to measure self-care maintenance. The questions ask participants how often they perform common recommendations for heart failure such as weighing yourself daily, eating a low salt diet, taking part in regular physical activity, keeping weight down, and getting a flu shot every year (Riegel et al., 2004). The questions are scored using a likert scale response category, with choices ranging from 1 = “never or rarely” to 4 = “always”. A chi-square analysis was performed to assess differences in proportion for each sub-question stratified by BMI category. Table 11 displays results of the test for the “never or rarely” response category only. Of all the questions that measured self-care maintenance, keeping weight down was the only behavior found to have a significant difference in proportion based on BMI category (p value = <0.0001).

**Daily Weigh-in**

The association between the daily weigh-in sub question and BMI category was not significant (p = 0.40). For the “never or rarely” response category, the differences in
portion for obese and normal weight participants was the same (35%) and slightly lower for the overweight category (32%).

**Eating a Low Salt Diet**

The association between BMI category and the eating a low sodium diet sub question was not statistically significant (p = 0.64). Among each BMI categories, normal weight participants had the highest proportion (14%) that “never or rarely” ate a low salt diet followed by obese participants (11%).

**Daily Physical Activity**

The association between BMI category and physical activity sub question was not statistically significant (p = 0.73). The proportion of participants in the “never or rarely” response category increased across BMI category (44% vs. 49% vs. 52% among normal, overweight, and obese groups respectively).

**Keeping Weight Down**

Of all self-care maintenance activities, only keeping weight down was significantly associated with BMI category (p = <0.0001). Obese participants had the highest number of participants in the “never or rarely” response category (29%). The proportion of participants in the never or rarely response category increased with BMI category (9% vs. 12% vs. 29% among normal, overweight and obese groups respectively).

**Getting a Yearly Flu Shot**

This association between getting a yearly flu shot and BMI category was not statistically significant (p= 0.32). There was a slight increase in the proportion of
participants in the “never or rarely” response with increased BMI category (18% vs. 21% vs. 22% among normal, overweight and obese groups respectively).

**Hypothesis 2d:** The relationship between perceived social support and self-care would be strongest among participants who were overweight and obese compared to those of normal weight.

To test whether BMI strengthened or weakened the relationship between social support and self-care, an interaction term of BMI and social support was created. Table 12 shows the results of the interaction term in adjusted logistic regression models for total self-care and sub-type. The interaction term did not meet the established threshold of 0.1 total self-care, maintenance, or management. As a result, adjusted analysis for total self-care, maintenance, and management were not stratified by BMI category.

**Summary of Results**

The following provides a summary of results for specific aim 1 and 2:

1. Differences in mean age based on BMI (p=<0.0001) with mean age decreasing with increasing BMI.
2. BMI differed based on gender (p=0.001) with the greatest proportion of females in the obese category (61%).
3. Social support was not significantly related to BMI category (p = 0.40).  
4. The difference in heart failure knowledge based on BMI was significant (p=0.01) with a decrease in proportion of participants with high levels of knowledge based on increasing levels of BMI.
5. Increase in the number of comorbidities, attending a regional referral center and high levels of heart failure knowledge were associated with increased odds of being heavier in adjusted analysis.

6. Increase in self-efficacy score, having high levels of social support and high levels of heart failure knowledge decreased odds of inadequate self-care total score.

7. Being obese was associated with an increase in odds of inadequate self-care maintenance while increase in self-efficacy, and seeing a cardiologist decreased odds of inadequate self-care maintenance in adjusted analysis.

8. Among self-care maintenance sub-scale questions, only keeping weight down was statistically associated with BMI category (p= <0.0001) with the proportion of participants responding never or rarely highest in the obese category (29%).

9. Increase in the number of comorbidities, high heart failure knowledge, increase in self-efficacy score and having heart failure 3-5 years were all associated with decrease in odds of low self-care management in adjusted analysis.

10. The threshold for stratification of total self-care, maintenance, and management by BMI category to determine interaction, was not met.
CHAPTER V
DISCUSSION

The chapter will begin with a summary of results for each Specific Aim, followed by a discussion of results and their implications in the context of existing literature. Explanation of future research steps, study strengths and limitations, and recommendations/implications for public health implications will conclude the chapter.

Summary of Results

For Specific Aim 1, sociodemographics such as age, income, educational attainment and marital status were statistically related to weight status. Mean age decreased as weight status increased, and the proportion of participants in each level of educational attainment decreased as weight status increased. There were a disproportionate number of women and African-American participants classified as obese compared to participants in the normal weight and overweight categories. Weight status was not found to be statistically associated with social support. Heart failure self-care knowledge was statistically related to weight status. The proportion of participants characterized as having low knowledge levels increased with decreasing BMI. Receiving care at a regional referral center, increase in the number of comorbidities and high self-care knowledge score were associated with an increase in odds of being heavier in adjusted analysis.

Among sociodemographic variables in Specific Aim 2, income was significantly associated with all measured self-care variables. Age was associated with self-care maintenance and self-care management. Marital status was associated with total self-care. Race and insurance status was associated with self-care maintenance. BMI was
significantly associated with self-care maintenance scores in both unadjusted and adjusted analyses. In adjusted analyses, being obese was associated with an increase in odds of inadequate self-care maintenance score. A one-point increase in self-efficacy score was associated with a decrease in the odds of inadequate total self-care, self-care maintenance, and self-care management. Compared to participants categorized as having low levels of social support, having high levels of social support was associated with a decrease in odds of inadequate total self-care. For each additional comorbidity, there was a decrease in odds of inadequate self-care management. Finally, the test to determine if BMI strengthens or weakens the relationship between self-care and social support was not significant for total self-care, maintenance, or management.

**Implication of Results**

**Specific Aim 1**

Within the study sample, African-American and female participants comprised the majority of participants in the obese category (70% and 61% respectively). Studies have shown similar results as it pertains to gender where females have higher mean BMI in study samples assessing disease risk or describing clinical profiles of participant population across a variety of chronic conditions (Barrios, Escobar, & Calderon, 2010; Miller et. al., 2008; Mokdad et al., 2003). In terms of race, this finding is also consistent with other studies in the literature, which show that African-American participants have higher BMI compared to other groups across a variety of diseases (Dickson et al., 2012). The distribution of weight status by race and gender reflect that of the broader U.S. population. These finding supported the hypotheses that African-American and female
heart failure participants would be more likely to be overweight or obese than Caucasians or males.

Although direct comparison cannot be made with statewide data, it can be used to make general comparisons of weight status to determine if certain groups may be disproportionately affected by heart failure in the sample. When examining the proportion of individuals classified as obese by gender, the percentages are similar. For years 2008 and 2009 using BRFSS data, females in Alabama comprised 67% and 70% of participants in the obese (BMI ≥ 30) category (CDC, 2013). With regards to race, African-Americans comprised increasing proportions within each BMI category as BMI increased. However, with regards to race, for years 2008 and 2009, the percentage of African-Americans in Alabama classified as obese (39% vs. 40% respectively) was roughly the same compared to whites (CDC, 2013). Based on these general comparisons, the study sample highlights a potential disproportionate burden of higher weight status by race among heart failure participants.

For other sociodemographic variables in the sample, there have been no studies that focus solely on comparisons of sociodemographic characteristics of heart failure participants using weight status as the primary outcome. As a result, it is difficult to directly compare these particular results from this dissertation to studies within the literature. The results do, however, reflect findings that are observed in studies that examine the prevalence of obesity based on sociodemographic characteristics and find that higher weight status may be inversely related to factors such as household income (Wang & Beydoun, 2007).
Social support was not associated with weight status in the sample (p = 0.40). This finding did not support the study hypothesis. One theory for this finding is that participants who are heavier may be more socially isolated and as a result report lower levels of social support. Participants who are heavier may have more functional limitations due to comorbidities and require more social support. Studies point to a lower quality of life among those who are socially isolated (Blickem et al., 2013).

Another explanation for this finding may be in the types of social support that were measured. The analysis used the scores from the MOS-SSS to assess perceived social support. This scale primarily measures support from family and friends and not spouses. Within the sample, 43% of participants were married. Social support received from spouses was not assessed. As a result, differences in association of weight status based on type of social support was not assessed and may have an impact on the relationship with weight status.

Interestingly, in the unadjusted regression those with high levels of self-care knowledge had increased odds of being heavier (OR 1.73, 95% CI, 1.21, 2.50) compared to those with low knowledge. Currently, there are no studies regarding heart failure that have looked at the direct link between weight status and knowledge. One theory for this finding is that weight status by itself may not have a direct role on self-care knowledge but may work with other factors such as comorbidities to impact knowledge and ultimately self-care. The effect of comorbidities on the uptake of heart failure self-care knowledge has been well documented in the literature (Bayliss et al, 2003; Dickson et al., 2011; Dickson et al., 2012; Kerr et al., 2007).
Self-care knowledge was associated with weight status (p= 0.01). Interestingly, obese participants comprised the smallest proportion with low self care knowledge (75%) compared to overweight (80%) and normal weight (87%). This finding is opposite of the study hypothesis. The association of self-care knowledge and weight status may be related to comorbidities. Overweight or obese participants may have more comorbidities compared to participants of normal weight. As such they may access the healthcare system more than participants with fewer comorbidities. This increase in healthcare visits may be tied to greater communication regarding heart failure self-care with their physician and may partially explain this association.

In adjusted analyses, a finding of an association of each additional comorbidity (OR 1.24, 95% CI 1.15, 1.40) increasing the odds of being heavier was consistent with the literature. Participants with multiple conditions such as hypertension and diabetes tend to be heavier since increased weight can be a risk factor for the development of these diseases (Malnick & Knobler, 2006; Borrios et al., 2010). The finding of an association of recruitment from a regional referral center (OR 1.50, 95%CI, 1.10, 2.13) and increased risk for being heavier was interesting in that the regional referral center may serve as a proxy for geographic locale. Both the teaching and safety-net hospitals are located in an urban area and treat participants from the surrounding area. The regional referral center treats participants mainly living in more rural areas. Studies have shown that people who live in rural areas may be heavier than those living in more urban areas (Jackson, Doescher, Jerant, & Hart; 2005; Patterson, Moore, Probse, & Shinogle, 2004). This may account for the observed association but since this dissertation did not originally use recruitment site as a proxy for geographic locale it cannot be stated with certainty.
Compared to those with low self-care knowledge, those with high self-care knowledge (OR 1.54, 95% CI 1.03, 2.31) had an increase in odds of being heavier. As stated above, no studies have looked at the direct association of weight status on levels of heart failure sign and symptom knowledge. However, because of the significant association of comorbidities in the adjusted analyses, further investigation into the theory of weight status, comorbidity, and self-care knowledge may be warranted.

**Specific Aim 2**

Within the sample, mean age was higher for participants in the adequate self-care maintenance and younger for those in the self-care management category. Sociodemographics have been studied to look at the association on self-care. Studies have shown that increased education attainment, older age, and having few comorbidities may have a positive impact on the uptake of self-care (Rockwell & Riegel, 2001; Suwanno, Petpichetchian, Riegel, & Issaramalai, 2009). For self-care maintenance, African-Americans (71%) disproportionately represented participants in the inadequate category. A greater percentage of married participants (50%) had adequate total self-care. Marital status may serve as a proxy for social support in this sample. Those who are married may have more effective supportive relationships that facilitate the uptake of self-care behaviors. Supportive relationships have been shown to improve self-care among heart failure participants (Salyer, 2012; Sebern, 2009).

For adjusted analyses, being obese was associated with an increase in odds of inadequate self-care maintenance (OR 1.70, 95% CI 1.10, 2.64). This finding partially supported the hypothesis in that obese participants would have lower self-care maintenance scores than those of normal weight. Interestingly for self-care maintenance,
type of doctor was associated with a 30% reduction in the odds of low self-care maintenance scores. This finding may suggest there is an association between receiving specialized care and better uptake of maintenance activities. Participants who get specialized care may receive more intensive follow-up or individualized care for their heart failure. Studies that assess the effect of multidisciplinary care on disease outcomes for conditions such as diabetes have shown improvements in health outcomes (Health Quality Ontario, 2009; Ip et al., 2013). This finding may warrant future investigation into the association of physician type and uptake of self-care.

Each increase in the number of comorbidities (OR 0.90, 95% CI 0.81, 0.98) was associated with a decrease in odds of inadequate self-care management. These findings may indicate that participants are treating symptoms as they occur rather than maintaining their condition on a daily basis. Self-efficacy was associated with a decrease in inadequate total-self-care (OR 0.97, 95% CI 0.96, 0.98), self-care maintenance (OR 0.99, 95% CI 0.99, 0.98, 0.99) and self-care management (OR 0.98, 95% CI 0.97, 0.99). For total self-care, this may also be associated with having high levels of social support and high self-care knowledge, which may also drive the association with self-care maintenance. These findings would be similar to studies within the literature which indicate participants who are more confident in their ability to perform specific self-care skills to maintain their health may be more likely to practice self-care (Goodman, Firouzi, Banya, Lau-Walker & Cowie 2012; Riegel, Dickson, & Topaz 2012; Salyer et al., 2011).

Studies have shown that increased self-care knowledge can help to improve the uptake of self-care behaviors (Boyde, Song, Peters, Turner, & Stewart 2013; Boyde et al.,
2011; Davis et al., 2012; Kommuri et al., 2012; Welsh et al., 2002). For total self-care (OR 0.50, 95% CI 0.30, 0.72), the positive association of self-care knowledge may also be explained by the positive association with social support. In terms of self-care management (OR, 0.50, 95% CI 0.31, 0.73), participants may be knowledgeable in treating worsening symptoms but not necessarily maintaining baseline health. Without looking specifically at each self-care knowledge question to find its association with total self-care, it is difficult to understand what drives the relationship. Finally, the test to determine if BMI strengthens or weakens the relationship between self-care and social support was not significant for total self-care, maintenance, or management. This finding may indicate that weight status may not act as a moderator as previously hypothesized but rather have a more direct impact on the extent to which participant’s levels of self-care may be affected. Additional studies are needed in this area.

Participants included in the analyses may be different from the broader heart failure population. As a result, this may have affected findings in regards to social support and self-care and their association with weight status. Listed below are descriptions of how participants may be different from the broader heart failure population and consequently may have affected the results of the study.

First, the study had a high proportion of participants who were insured across all BMI categories. As such, participants may be more actively engaged with the healthcare system, communicate with their healthcare provider regarding their condition, and receive support to address difficulties with practicing self-care. This in turn may have a positive effect on perceived levels of social support within the sample. The significant association between self-care maintenance and insurance status may further reiterate this
explanation. Second, the finding of insurance status may also be related to heart failure self-care knowledge within the sample. This may also tie into the observation of increased odds of being heavier among participants with high levels of self-care knowledge. Participants who are actively engaged in the healthcare system may receive more information regarding self-care practice or support when they have issues performing self-care behaviors. Participants who are overweight or obese may engage the healthcare system more than those who are normal weight due to comorbidities and as a result be exposed to more information regarding heart failure self-care. Third, as previously stated, by not accounting for spousal support, the analyses may miss an association based on weight status that was not captured using the MOS-SSS. Finally, two of the three sites used to recruited participants were from a metropolitan area. The sample may differ compared to individuals who live in smaller or more rural areas.

The association between heart failure self-care and BMI may have also been affected by the nature of the study design. Because of the cross-sectional nature of the study, measures of BMI cannot be assessed over time to observe changes in associations of total self-care, maintenance, and management. The original three studies only assessed weight status at baseline among heart failure participants. Similar to suggestions for studies regarding the obesity paradox, measuring changes of weight over time may yield more information into the association rather than a measure at one point in time.

**Study Strengths and Limitations**

The project has several strengths. First, participants recruited from three different hospital types (teaching, safety-net, and regional referral) were included in the analyses.
This allowed for broader comparisons based on service utilization. Second, the diversity of the sample with respect to race and gender allowed for more robust analyses and comparisons. It is important to understand how self-care practice may vary based on race and gender to develop more tailored programs to improve outcomes. Third, the study analyzed data collected from previously validated scales within the literature, many of which are disease specific. The strength in validated surveys is that they provide a more accurate reflection of behaviors, beliefs, and attitudes specific to heart failure.

Obesity is often studied in conjunction with other co-morbid condition as it relates to uptake of self-care. A strength and uniqueness of this study is that the association of obesity and other co-morbid conditions were examined separately in analyses to derive separate associations with total self-care, management, and maintenance. The hypotheses tested in this study provide a unique contribution to existing literature regarding self-care. **It is the first to explore the direct association of weight status on heart failure self-care.**

A few study limitations are inherent to the design of this dissertation. All analyses were performed using existing study data which did not allow for control over how data was collected and coded. In addition, as this study utilized a cross-sectional design, results can only evaluate associations between weight status and self-care and cannot attribute causality to any observed relationship between variables.

Chi-square tests were used to assess differences in proportions between categorical variables. However, it does not indicate where these differences occur. Since the analyses explored an area that has not been extensively studied in the literature,
the analyses and results provided preliminary insight into the relationship between weight status and self-care and justification for future studies.

Although the self-report data in this study derived a participant profile of the sample, it is possible the data may have been subject to social desirability bias and measurement error. Participants may misrepresent their self-care behavior in an attempt to provide answers they feel the interviewer may want to hear. In addition, measurements such as height and weight may be misrepresented and not accurately reflect weight status within this population.

Finally, it is recognized that certain clinical, sociodemographic, and psychosocial profiles of heart failure participants in this sample may not generalize to the entire heart failure population. First, as previously noted, the study sample is unique in that it had a high proportion of insured participants (92%). As a result, they may have more access to the health care system, and be more engaged with their care than the wider heart failure population. Second, most participants were categorized as having moderate levels of social support. The level of social support in the sample may not be normally distributed and may skew toward the higher end of the moderate category thus affecting results. However, study findings warrant additional studies in this area utilizing a longitudinal study designs to explore the relationship between weight status and self-care.

**Future Research**

There are several analyses that can be conducted to further investigate findings from this dissertation. Based on findings in descriptive analyses from Specific Aim 1, stratified analyses by race and gender could be conducted to understand any disparities in heart failure based on these characteristics. The association between comorbidities, self-
care knowledge, and weight status also warrants further investigation to potentially provide a more in-depth view of how weight status may affect self-care knowledge among heart failure participants. The association between total self-care and social support could also be re-examined using social support subscales to determine the specific type(s) of support (e.g., tangible) related to self-care. Another analysis would be to use recruitment site as a proxy for location to assess differences in association with self-care by geographic locale.

As mentioned in the methodology, the Riegel Heart Failure Self-care index was recently updated. Data for this dissertation uses scores from the older version of the scale. Next steps would be to rerun the data using the newer version of the scale with particular focus on self-care maintenance to see if there are changes in scores.

**Public Health Recommendations**

The following recommendations are suggested based on the findings from this dissertation:

- Because obesity is a risk factor related to development of heart failure, more work must be done to understand its impact on uptake of self-care behaviors (particularly self-care maintenance) to improve participant outcomes.

- Development of self-care guidelines that take comorbid conditions into account is needed to provide participants with a more comprehensive and realistic method of managing heart failure in the context of other diseases.

- Increasing participant self-efficacy in performance of self-care behaviors though skill-building techniques are needed to help facilitate the uptake of self-care behaviors.

- Development of tailored self-care-educational programs that match participant’s individual needs to improve outcomes may be helpful. Matching support and counseling to a participant’s ability and/or willingness to receive information may increase the likelihood of the uptake of self-care practices.
Development of tools to evaluate programs will support ongoing improvement and ultimately help implement best practices in delivery of self-care materials and concepts.

Further evaluation of best methods to understand the exact mechanisms of the obesity paradox are needed to understand its impact on participant mortality. Specifically, the development of more standard measures of adiposity are needed to help effectively investigate the role of obesity on heart failure mortality.

**Conclusion**

This dissertation highlighted the relationship of weight status with heart failure self-care. The findings suggest a disparity in weight status among heart failure participants based on gender and race and are similar to studies which explore health outcomes based on sociodemographic characteristics. The association between weight status and self-care maintenance indicate that weight status may have a negative association on the uptake of self-care behaviors. **This novel finding supports the dissertation hypothesis and is one of the first of its kind in the area of self-care.** The association of self-efficacy with self-care total score, self-care maintenance, and self-care management further reiterate findings in the literature and poses new questions into how self-efficacy works based on self-care subtype. In addition, the association of social support and heart failure total self-care are also in line with the literature in this area. The association between specialty care and recruitment site are interesting findings not previously accounted for but add new explanations for uptake of self-care into the literature. These findings also provide insight into specific areas where focus is needed in developing more effective chronic disease programs. Overall, the study adds significant contribution to the literature and lays the foundation for additional analysis in the area of heart failure self care.


American Heart Association. (2013, 08/20/2012). Types of heart failure. Retrieved from: http://www.heart.org/HEARTORG/Conditions/HeartFailure/AboutHeartFailure/Types-of-Heart-Failure_UCM_306323_Article.jsp


RAND Health (2010, 09/15/2010). Medical Outcomes Study: Social Support


Riegel, B., Dickson, V. V., & Topaz, M. (2012). Qualitative Analysis of Naturalistic Decision Making in Adults With Chronic Heart Failure. *Nurs Re, 1-8.*


**Table 1: Participant inclusion and exclusion criteria**

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosed with heart failure by administrative data (ICD-9) or DRG administrative data from January 1, 2006 to January 1, 2009; (teaching and regional referral center)</td>
<td>≤ 40 years old</td>
</tr>
<tr>
<td>Primary care physician referral based on known heart failure diagnosis (safety-net)</td>
<td>Non-English speaking</td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hispanic origin</td>
</tr>
<tr>
<td>Living in a nursing home</td>
</tr>
<tr>
<td>Heart transplant recipient or waiting for heart transplant</td>
</tr>
<tr>
<td>Unable to sit through a 45-minute interview</td>
</tr>
</tbody>
</table>

¹Exclusion criteria for participants recruited from the teaching hospital, regional referral center and safety-net hospital.
Table 2: Characteristics of scales used in data collection

<table>
<thead>
<tr>
<th>Name of Scale</th>
<th>Variables Measured</th>
<th>Scoring Range</th>
<th>Number of Items</th>
<th>Reliability Score (Cronbach’s alpha)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riegel Heart Failure Self-care Index ²,⁶</td>
<td>Self-care maintenance, management, and confidence</td>
<td>0-300</td>
<td>15</td>
<td>Total scale: .76</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Maintenance: .56</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Management: .70</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Confidence: .82</td>
</tr>
<tr>
<td>Medical Outcomes Study-Social Support Scale³</td>
<td>Emotional/ informational; tangible; positive interaction; and affectionate levels of social support</td>
<td>0-100</td>
<td>19</td>
<td>Emotional: .96</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tangible: .92</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Positive Interaction: .94</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Affectionate: .91</td>
</tr>
<tr>
<td>DeWalt Knowledge of Choric Heart Failure Knowledge⁴</td>
<td>Heart Failure knowledge of signs and symptoms</td>
<td>0-15</td>
<td>15</td>
<td>See below⁷</td>
</tr>
<tr>
<td>Kansas City Cardiomyopathy Questionnaire⁵</td>
<td>Physical limitation; symptoms; quality of life; social limitation; self-efficacy³; functional status; clinical summary score</td>
<td>0-100</td>
<td>15</td>
<td>Physical limitation: .90</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Symptoms: .88</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Quality of life: .78</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Social limitation: .86</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Self-efficacy: .62⁸</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Functional status: .93</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Clinical summary score: .95</td>
</tr>
</tbody>
</table>

¹Derived from prior data collected during the development and testing of each scale.
⁶ Denotes information for the original version of the Riegel Heart Failure Self-care Index
⁷ Reliability scores not reported. Mean knowledge difference: -3.3% (95% CI: -9.5, 2.8); Mean change in self-efficacy: 1.2 (95% CI: 0.06, 2.3)
⁸ Based on comparison of mean score between stable outpatients with heart failure and those admitted (67.6 vs. 83.5; p<0.0001) and patients in response cohort who improved scores (67.6 vs. 83.0; p<0.0001).
Table 3: Baseline characteristics of the study population (n= 690)* stratified by BMI category

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total (n=690)</th>
<th>BMI Category</th>
<th>p-value¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Normal weight &gt;18.5-24.9 kg/m² (n=154)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Overweight &gt;25-29.9 kg/m² (n=197)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Obese ≥ 30 kg/m² (n=339)</td>
<td></td>
</tr>
<tr>
<td>Sociodemographic factors</td>
<td></td>
<td>n (%), or Mean ± (SD)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>63 ± 12</td>
<td>67 ± 12</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>373 (54)</td>
<td>77 (50)</td>
<td>89 (45)</td>
</tr>
<tr>
<td>African-American</td>
<td>452 (66)</td>
<td>88 (57)</td>
<td>127 (65)</td>
</tr>
<tr>
<td>Household Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; $20,000</td>
<td>448 (65)</td>
<td>82 (53)</td>
<td>116 (59)</td>
</tr>
<tr>
<td>$20,000-39,999</td>
<td>148 (21)</td>
<td>44 (29)</td>
<td>51 (26)</td>
</tr>
<tr>
<td>$ 40,000-59,999</td>
<td>51 (7)</td>
<td>12 (8)</td>
<td>16 (8)</td>
</tr>
<tr>
<td>$ 60,000-79,999</td>
<td>17 (3)</td>
<td>6 (4)</td>
<td>7 (4)</td>
</tr>
<tr>
<td>&gt; $80,000</td>
<td>26 (4)</td>
<td>10 (6)</td>
<td>7 (4)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; High school</td>
<td>218 (32)</td>
<td>52 (34)</td>
<td>50 (25)</td>
</tr>
<tr>
<td>Graduated high school</td>
<td>206 (30)</td>
<td>33 (21)</td>
<td>71 (36)</td>
</tr>
<tr>
<td>Some college</td>
<td>181 (26)</td>
<td>46 (30)</td>
<td>50 (25)</td>
</tr>
<tr>
<td>College graduate</td>
<td>65 (9)</td>
<td>20 (13)</td>
<td>21 (11)</td>
</tr>
<tr>
<td>Completed prof./grad. school</td>
<td>20 (3)</td>
<td>3 (2)</td>
<td>5 (3)</td>
</tr>
<tr>
<td>Married</td>
<td>299 (43)</td>
<td>64 (42)</td>
<td>104 (53)</td>
</tr>
<tr>
<td>Insured</td>
<td>635 (92)</td>
<td>145 (94)</td>
<td>179 (91)</td>
</tr>
<tr>
<td>Clinical factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of time with heart failure diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>135 (20)</td>
<td>38 (25)</td>
<td>46 (24)</td>
</tr>
<tr>
<td>1-3 years</td>
<td>192 (28)</td>
<td>43 (28)</td>
<td>53 (27)</td>
</tr>
<tr>
<td>3-5 years</td>
<td>130 (18)</td>
<td>25 (16)</td>
<td>33 (16)</td>
</tr>
<tr>
<td>&gt; 5 years</td>
<td>233 (34)</td>
<td>48 (31)</td>
<td>65 (33)</td>
</tr>
<tr>
<td>Hospital type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional referral center</td>
<td>213 (31)</td>
<td>39 (25)</td>
<td>61 (31)</td>
</tr>
<tr>
<td>Safety-net</td>
<td>136 (20)</td>
<td>26 (17)</td>
<td>35 (18)</td>
</tr>
<tr>
<td>Teaching</td>
<td>341 (49)</td>
<td>89 (58)</td>
<td>101 (51)</td>
</tr>
<tr>
<td>Number of comorbidities</td>
<td>5 ± 2</td>
<td>4 ± 2</td>
<td>5 ± 2</td>
</tr>
<tr>
<td>Heart failure severity</td>
<td>59 ± 24</td>
<td>64 ± 23</td>
<td>62 ± 22</td>
</tr>
<tr>
<td>Primary-care physician</td>
<td>370 (54)</td>
<td>81 (52)</td>
<td>95 (48)</td>
</tr>
</tbody>
</table>

¹Comparison between BMI categories
*Participants with BMI >18.5 are excluded from analysis.
Chi-square test used to test differences in proportions
ANOVA test used to test differences in means
<table>
<thead>
<tr>
<th>Psychosocial factors</th>
<th>77 ± 24</th>
<th>77 ± 24</th>
<th>79 ± 23</th>
<th>75 ± 24</th>
<th>0.33</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy for heart failure self-care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressed</td>
<td>315 (46)</td>
<td>63 (41)</td>
<td>83 (42)</td>
<td>169 (50)</td>
<td>0.10</td>
</tr>
<tr>
<td>Low total heart failure self-care</td>
<td>480 (70)</td>
<td>104 (68)</td>
<td>133 (68)</td>
<td>243 (72)</td>
<td>0.50</td>
</tr>
<tr>
<td>Social support (total score)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>217 (31)</td>
<td>46 (30)</td>
<td>57 (29)</td>
<td>114 (34)</td>
<td>0.40</td>
</tr>
<tr>
<td>Moderate</td>
<td>225 (33)</td>
<td>58 (38)</td>
<td>68 (35)</td>
<td>99 (29)</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>248 (36)</td>
<td>50 (32)</td>
<td>72 (36)</td>
<td>126 (37)</td>
<td></td>
</tr>
<tr>
<td>Trust in physicians</td>
<td>72 ± 13</td>
<td>72 ± 14</td>
<td>72 ± 12</td>
<td>72 ± 13</td>
<td>0.80</td>
</tr>
<tr>
<td>Low heart failure knowledge</td>
<td>546 (79)</td>
<td>134 (87)</td>
<td>158 (80)</td>
<td>254 (75)</td>
<td>0.01</td>
</tr>
</tbody>
</table>

1Comparison between BMI categories
*Participants with BMI >18.5 are excluded from analysis.
Chi-square tests used to test differences in proportions
ANOVA used to test differences in mean
Table 4: Unadjusted and adjusted cumulative logistic regression results for odds for higher weight

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Unadjusted O.R (95% CI)</th>
<th>Adjusted O.R (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinical factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of time with heart failure diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year (ref)</td>
<td>1</td>
<td>1.00 (0.99, 1.00)</td>
</tr>
<tr>
<td>1-3 years</td>
<td>1.52 (1.01, 2.30)</td>
<td>1.31 (0.90, 2.02)</td>
</tr>
<tr>
<td>3-5 years</td>
<td>1.90 (1.20, 3.00)</td>
<td>1.50 (0.91, 2.41)</td>
</tr>
<tr>
<td>&gt; 5 years</td>
<td>1.64 (1.11, 2.44)</td>
<td>1.40 (0.90, 2.14)</td>
</tr>
<tr>
<td>Hospital type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety-net</td>
<td>1.54 (0.10, 2.25)</td>
<td>1.21 (0.80, 1.90)</td>
</tr>
<tr>
<td>Regional referral center</td>
<td>1.50 (1.10, 2.03)</td>
<td>1.50 (1.10, 2.13)</td>
</tr>
<tr>
<td>Teaching (ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of comorbidities</td>
<td>1.30 (1.20, 1.35)</td>
<td>1.24 (1.15, 1.40)</td>
</tr>
<tr>
<td>Heart failure severity</td>
<td>0.99 (0.98, 0.99)</td>
<td>1.00 (0.99, 1.00)</td>
</tr>
<tr>
<td>Type of doctor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiologist</td>
<td>0.81 (0.61, 1.10)</td>
<td>0.82 (0.61, 1.12)</td>
</tr>
<tr>
<td>Primary-care (ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychosocial factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy for heart failure self-care</td>
<td>1.00 (0.99, 1.00) ^1</td>
<td>1.00 (0.99, 1.00) ^1</td>
</tr>
<tr>
<td>Social support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>0.97 (0.70, 1.40)</td>
<td>1.10 (0.72, 1.20)</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.73 (0.51, 1.04)</td>
<td>0.70 (0.50, 0.98)</td>
</tr>
<tr>
<td>Low (ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>1.40 (1.02, 1.81)</td>
<td>0.72 (0.50, 1.02)</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No (ref)</td>
<td>1.00 (0.99, 1.02) ^1</td>
<td>1.01 (0.99, 1.02)</td>
</tr>
<tr>
<td>Trust in physicians</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart failure knowledge</td>
<td>1.73 (1.21, 2.50)</td>
<td>1.54 (1.03, 2.31)</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (ref)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Participants with BMI >18.5 are excluded from analysis.
Adjusted by age, race, income, education, marital status, insurance status, body mass index, length of time with heart failure diagnosis, depression, hospital type, insurance status, number of comorbidities, heart failure severity, heart failure self-efficacy, type of doctor, social support, trust in physicians, medication adherence, and heart failure sign and symptom knowledge.
Bold ORs have p-value <0.05
^1 OR of 1.00 due to rounding
Table 5: Baseline characteristics stratified by total self-care score

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total Self-care category</th>
<th></th>
<th></th>
<th>p-value¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inadequate total self-care score (n= 480)</td>
<td>Adequate total self-care score (n= 210)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>n (%) or Mean ± (SD)</td>
<td>n (%) or Mean ± (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sociodemographic factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>63 ± 12</td>
<td>62 ± 11</td>
<td>0.21</td>
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<td>105 (50)</td>
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<tr>
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<td>College graduate</td>
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<td>Body Mass Index</td>
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<td></td>
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<tr>
<td>Normal weight</td>
<td>104 (22)</td>
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<td>0.49</td>
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<td>133 (28)</td>
<td>64 (30)</td>
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<tr>
<td>Obese</td>
<td>243 (50)</td>
<td>96 (46)</td>
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<tr>
<td>Length of time with heart failure diagnosis</td>
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</tr>
<tr>
<td>&lt; 1 year</td>
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<td>0.046</td>
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<td>143 (30)</td>
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<td>3-5 years</td>
<td>78 (16)</td>
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<tr>
<td>&gt; 5 years</td>
<td>16 (34)</td>
<td>70 (33)</td>
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<tr>
<td>Hospital type</td>
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<tr>
<td>Regional referral center</td>
<td>143 (30)</td>
<td>70 (33)</td>
<td>0.14</td>
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<tr>
<td>Safety-net</td>
<td>104 (22)</td>
<td>32 (15)</td>
<td></td>
<td></td>
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<tr>
<td>Teaching</td>
<td>233 (48)</td>
<td>108 (52)</td>
<td></td>
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<tr>
<td>Number of comorbidities</td>
<td>5 ± 2</td>
<td>5 ± 2</td>
<td>0.88</td>
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<tr>
<td>Heart failure severity</td>
<td>57 ± 24</td>
<td>63 ± 24</td>
<td>0.001</td>
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</tr>
<tr>
<td>Primary-care physician for heart failure</td>
<td>268 (56)</td>
<td>102 (49)</td>
<td>0.10</td>
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</tr>
</tbody>
</table>

¹ P-value for chi-square comparison between total self-care categories
*Participants with BMI >18.5 are excluded from analysis.
Chi-square tests used to test differences in proportions
ANOVA test used to test differences in mean
A cut point of 210 is used to classify participants having an "adequate" or "inadequate" total self-care score; Riegel, B., Lee, C.S., Dickson, V.V., & Carlson B., (2009)
Table 5, continued

<table>
<thead>
<tr>
<th>Psychosocial factors</th>
<th>72 ± 25</th>
<th>88 ± 17</th>
<th>&lt;0.0001</th>
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<tbody>
<tr>
<td>Self-efficacy for heart failure self-care</td>
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</tr>
<tr>
<td>Depressed</td>
<td>231 (48)</td>
<td>84 (40)</td>
<td>0.049</td>
</tr>
<tr>
<td>Social support (total score)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>174 (36)</td>
<td>43 (20)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Moderate</td>
<td>160 (33)</td>
<td>65 (31)</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>146 (31)</td>
<td>102 (49)</td>
<td></td>
</tr>
<tr>
<td>Trust in physicians</td>
<td>71 ± 12</td>
<td>74 ± 13</td>
<td>0.003</td>
</tr>
<tr>
<td>Low heart failure knowledge</td>
<td>405 (84)</td>
<td>145 (67)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

1 P-value for chi-square comparison between total self-care categories
*Participants with BMI > 18.5 are excluded from analysis.
Chi-square test used to test differences in proportions
ANOVA test used to test differences in mean
A cut point of 210 is used to classify participants having an “adequate” or “inadequate” total self-care score; Riegel, B., Lee, C.S., Dickson, V.V., & Carlson B., (2009)
Table 6: Baseline characteristics stratified by self-care maintenance score

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Self-care maintenance category</th>
<th></th>
<th>p-value&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inadequate self-care maintenance (n = 441)</td>
<td>Adequate self-care maintenance (n = 249)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n (%) or Mean ± (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sociodemographic factors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>61 ± 12</td>
<td>65 ± 12</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Female</td>
<td>243 (55)</td>
<td>130 (52)</td>
<td>0.50</td>
</tr>
<tr>
<td>African-American</td>
<td>311 (71)</td>
<td>141 (57)</td>
<td>0.0002</td>
</tr>
<tr>
<td>Household Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;$20,000</td>
<td>305 (69)</td>
<td>143 (57)</td>
<td>0.01</td>
</tr>
<tr>
<td>$20,000-39,999</td>
<td>90 (21)</td>
<td>58 (24)</td>
<td></td>
</tr>
<tr>
<td>$40,000-59,999</td>
<td>27 (6)</td>
<td>24 (10)</td>
<td></td>
</tr>
<tr>
<td>$60,000-79,999</td>
<td>9 (2)</td>
<td>8 (3)</td>
<td></td>
</tr>
<tr>
<td>&gt;$80,000</td>
<td>10 (2)</td>
<td>16 (6)</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; High School</td>
<td>134 (31)</td>
<td>84 (34)</td>
<td>0.30</td>
</tr>
<tr>
<td>Graduated high school</td>
<td>143 (32)</td>
<td>63 (25)</td>
<td></td>
</tr>
<tr>
<td>Some college</td>
<td>113 (26)</td>
<td>68 (27)</td>
<td></td>
</tr>
<tr>
<td>College graduate</td>
<td>41 (9)</td>
<td>24 (10)</td>
<td></td>
</tr>
<tr>
<td>Completed prof./grad. school</td>
<td>10 (2)</td>
<td>10 (4)</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>180 (41)</td>
<td>119 (48)</td>
<td>0.10</td>
</tr>
<tr>
<td>Insured</td>
<td>399 (90)</td>
<td>236 (95)</td>
<td>0.05</td>
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<td><strong>Clinical factors</strong></td>
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<td></td>
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<tr>
<td>Body Mass Index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal weight</td>
<td>82 (19)</td>
<td>72 (29)</td>
<td>0.002</td>
</tr>
<tr>
<td>Overweight</td>
<td>123 (28)</td>
<td>74 (30)</td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>236 (53)</td>
<td>103 (41)</td>
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<tr>
<td>Length of time with heart failure diagnosis</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>92 (21)</td>
<td>43 (17)</td>
<td>0.10</td>
</tr>
<tr>
<td>1-3 years</td>
<td>133 (30)</td>
<td>59 (24)</td>
<td></td>
</tr>
<tr>
<td>3-5 years</td>
<td>80 (18)</td>
<td>50 (20)</td>
<td></td>
</tr>
<tr>
<td>&gt; 5 years</td>
<td>136 (31)</td>
<td>97 (39)</td>
<td></td>
</tr>
<tr>
<td>Hospital type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional referral center</td>
<td>126 (29)</td>
<td>87 (35)</td>
<td>0.01</td>
</tr>
<tr>
<td>Safety-net</td>
<td>103 (23)</td>
<td>33 (13)</td>
<td></td>
</tr>
<tr>
<td>Teaching</td>
<td>212 (48)</td>
<td>129 (52)</td>
<td></td>
</tr>
<tr>
<td>Number of comorbidities</td>
<td>5 ± 2</td>
<td>5 ± 2</td>
<td>0.12</td>
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<tr>
<td>Heart failure severity</td>
<td>56 ± 22</td>
<td>63 ± 25</td>
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<td>Primary-care physician for heart failure</td>
<td>259 (59)</td>
<td>111 (45)</td>
<td>0.0003</td>
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</table>

<sup>1</sup>P-value for chi-square comparison between self-care maintenance categories

*Participants with BMI >18.5 are excluded from analysis.

Chi-square tests used to test differences in proportions

ANOVA test used to test differences in mean

A cut point of 70 is used to classify participants having an “adequate” or “inadequate” self-care maintenance score; Riegel, B., Lee, C.S., Dickson, V.V., & Carlson B., (2009)
Table 6, continued

<table>
<thead>
<tr>
<th>Psychosocial factors</th>
<th>Self-efficacy for heart failure self-care</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>74 ± 25</td>
<td>82 ± 20</td>
<td>&lt;0.0001</td>
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</tr>
<tr>
<td>Depressed</td>
<td>223 (51)</td>
<td>92 (37)</td>
<td>0.001</td>
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</tr>
<tr>
<td>Social support (total score)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>158 (36)</td>
<td>59 (24)</td>
<td>0.001</td>
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<tr>
<td>Moderate</td>
<td>142 (32)</td>
<td>83 (33)</td>
<td></td>
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<tr>
<td>High</td>
<td>141 (32)</td>
<td>107 (43)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trust in physicians</td>
<td>71 ± 13</td>
<td>73 ± 12</td>
<td>0.01</td>
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<tr>
<td>Low heart failure knowledge</td>
<td>354 (80)</td>
<td>192 (77)</td>
<td>0.33</td>
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</table>

1 P-value for chi-square comparison. between self-care maintenance categories
*Participants with BMI >18.5 are excluded from analysis.
Chi-square tests used to test differences in proportions
ANOVA used to test differences in mean
A cut point of 70 is used to classify participants having an “adequate” or “inadequate” self-care maintenance score; Riegel, B., Lee, C.S., Dickson, V.V., & Carlson B., (2009)
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Self-care management category</th>
<th>p-value&lt;sup&gt;1&lt;/sup&gt;</th>
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<td></td>
<td>Inadequate self-care management (n= 424)</td>
<td>Adequate self-care management (n= 266)</td>
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<td></td>
<td>n (%) or Mean + (SD)</td>
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<tr>
<td>Sociodemographic factors</td>
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<tr>
<td>Age</td>
<td>64 ± 12</td>
<td>61 ± 11</td>
</tr>
<tr>
<td>Female</td>
<td>228 (54)</td>
<td>145 (55)</td>
</tr>
<tr>
<td>African-American</td>
<td>278 (65)</td>
<td>174 (66)</td>
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<td>$&lt;20,000</td>
<td>281 (66)</td>
<td>167 (63)</td>
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<td>56 (21)</td>
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<td>$40,000-59,999</td>
<td>27 (6)</td>
<td>24 (9)</td>
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<tr>
<td>$60,000-79,999</td>
<td>5 (1)</td>
<td>12 (4)</td>
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<td>$&gt;80,000</td>
<td>19 (5)</td>
<td>7 (3)</td>
</tr>
<tr>
<td>Education</td>
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<td></td>
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<tr>
<td>&lt; High School</td>
<td>148 (35)</td>
<td>70 (26)</td>
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<tr>
<td>Graduated high school</td>
<td>119 (28)</td>
<td>87 (33)</td>
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<tr>
<td>Some college</td>
<td>102 (24)</td>
<td>79 (30)</td>
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<tr>
<td>College graduate</td>
<td>40 (9)</td>
<td>25 (9)</td>
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<tr>
<td>Completed prof./grad. school</td>
<td>15 (4)</td>
<td>5 (2)</td>
</tr>
<tr>
<td>Married</td>
<td>178 (42)</td>
<td>121 (46)</td>
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<tr>
<td>Insured</td>
<td>395 (93)</td>
<td>240 (90)</td>
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<td>Clinical factors</td>
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<tr>
<td>Body Mass Index</td>
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<td></td>
</tr>
<tr>
<td>Normal weight</td>
<td>102 (24)</td>
<td>52 (20)</td>
</tr>
<tr>
<td>Overweight</td>
<td>121 (28)</td>
<td>76 (28)</td>
</tr>
<tr>
<td>Obese</td>
<td>201 (47)</td>
<td>138 (52)</td>
</tr>
<tr>
<td>Length of time with heart failure diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>95 (22)</td>
<td>40 (15)</td>
</tr>
<tr>
<td>1-3 years</td>
<td>126 (30)</td>
<td>66 (25)</td>
</tr>
<tr>
<td>3-5 years</td>
<td>64 (15)</td>
<td>66 (25)</td>
</tr>
<tr>
<td>&gt; 5 years</td>
<td>139 (33)</td>
<td>94 (35)</td>
</tr>
<tr>
<td>Hospital type</td>
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<td>Regional referral center</td>
<td>126 (30)</td>
<td>87 (33)</td>
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<td>Safety-net</td>
<td>88 (21)</td>
<td>48 (18)</td>
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<td>210 (50)</td>
<td>131 (49)</td>
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<td>Number of comorbidities</td>
<td>4.6 ± 2</td>
<td>5.2 ± 2</td>
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<tr>
<td>Heart failure severity</td>
<td>60 ± 23</td>
<td>57 ± 24</td>
</tr>
<tr>
<td>Primary-care physician for heart failure</td>
<td>235 (55)</td>
<td>135 (51)</td>
</tr>
</tbody>
</table>

<sup>1</sup> P-value for chi-square comparison between self-care management categories

*Participants with BMI >18.5 are excluded from analysis.

Chi-square tests used to test differences in proportions

ANOVA used to test differences in mean

A cut point of 70 is used to classify participants having an “adequate” or “inadequate” self-care management score; Riegel, B., Lee, C.S., Dickson, V.V., & Carlson B., (2009)
Table 7, continued

<table>
<thead>
<tr>
<th>Psychosocial factors</th>
<th>73 ± 25</th>
<th>83 ± 20</th>
<th>&lt;0.0001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy for heart failure self-care</td>
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<td></td>
</tr>
<tr>
<td>Depressed</td>
<td>182 (43)</td>
<td>133 (50)</td>
<td>0.10</td>
</tr>
<tr>
<td>Social support (total score)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>145 (34)</td>
<td>72 (27)</td>
<td>0.12</td>
</tr>
<tr>
<td>Moderate</td>
<td>136 (32)</td>
<td>89 (33)</td>
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</tr>
<tr>
<td>High</td>
<td>143 (34)</td>
<td>105 (40)</td>
<td></td>
</tr>
<tr>
<td>Trust in physicians</td>
<td>71 ± 12</td>
<td>73 ± 13</td>
<td>0.02</td>
</tr>
<tr>
<td>Low heart failure knowledge</td>
<td>365 (86)</td>
<td>181 (68)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

1 P-value for chi-square comparison between self-care management categories
*Participants with BMI >18.5 are excluded from analysis.
Chi-square tests used to test differences in proportions
ANOVA used to test differences in mean
A cut point of 70 is used to classify participants having an “adequate” or
“inadequate” self-care management score; Riegel, B., Lee, C.S., Dickson, V.V.,
& Carlson B., (2009)
Table 8: Unadjusted and adjusted logistic regression results for odds of inadequate total self-care

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Unadjusted O.R (95% CI)</th>
<th>Adjusted O.R (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinical factors</strong></td>
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<td></td>
</tr>
<tr>
<td>Body Mass Index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>1.22 (0.81, 1.84)</td>
<td>1.40 (0.90, 2.31)</td>
</tr>
<tr>
<td>Overweight</td>
<td>1.00 (0.63, 1.60)</td>
<td>1.20 (0.72, 2.00)</td>
</tr>
<tr>
<td>Normal weight (ref)</td>
<td>1.00 (0.63, 1.60)</td>
<td>1.20 (0.72, 2.00)</td>
</tr>
<tr>
<td>Length of time with heart failure diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year (ref)</td>
<td>1.20 (0.72, 1.94)</td>
<td>1.40 (0.80, 2.40)</td>
</tr>
<tr>
<td>1-3 years</td>
<td>0.61 (0.40, 1.02)</td>
<td>0.74 (0.42, 1.31)</td>
</tr>
<tr>
<td>3-5 years</td>
<td>0.95 (0.60, 1.51)</td>
<td>1.24 (0.73, 2.11)</td>
</tr>
<tr>
<td>&gt; 5 years</td>
<td>0.95 (0.60, 1.51)</td>
<td>1.24 (0.73, 2.11)</td>
</tr>
<tr>
<td>Hospital type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety-net</td>
<td>1.51 (0.95, 2.40)</td>
<td>1.30 (0.73, 2.20)</td>
</tr>
<tr>
<td>Regional referral center</td>
<td>0.95 (0.70, 1.40)</td>
<td>0.98 (0.64, 1.50)</td>
</tr>
<tr>
<td>Teaching (ref)</td>
<td>1.00 (0.63, 1.60)</td>
<td>1.20 (0.72, 2.00)</td>
</tr>
<tr>
<td>Number of comorbidities</td>
<td>0.99 (0.91, 1.10)</td>
<td>0.94 (0.90, 1.10)</td>
</tr>
<tr>
<td>Heart failure severity</td>
<td><strong>0.99 (0.98, 0.99)</strong></td>
<td>0.99 (0.98, 1.00)</td>
</tr>
<tr>
<td>Type of doctor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiologist</td>
<td>0.75 (0.54, 1.03)</td>
<td>1.00 (0.70, 1.50)</td>
</tr>
<tr>
<td>Primary-care (ref)</td>
<td>1.00 (0.70, 1.50)</td>
<td>1.00 (0.70, 1.50)</td>
</tr>
<tr>
<td><strong>Psychosocial factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy for heart failure self-care</td>
<td><strong>0.96 (0.95, 0.97)</strong></td>
<td><strong>0.97 (0.96, 0.98)</strong></td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.40 (1.00, 1.93)</td>
<td>0.92 (0.60, 1.41)</td>
</tr>
<tr>
<td>No (ref)</td>
<td>1.00 (0.63, 1.60)</td>
<td>1.20 (0.72, 2.00)</td>
</tr>
<tr>
<td>Social support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td><strong>0.40 (0.23, 0.54)</strong></td>
<td><strong>0.60 (0.40, 0.94)</strong></td>
</tr>
<tr>
<td>Moderate</td>
<td><strong>0.61 (0.40, 0.95)</strong></td>
<td>0.80 (0.50, 1.30)</td>
</tr>
<tr>
<td>Low (ref)</td>
<td>1.00 (0.70, 1.50)</td>
<td>1.00 (0.70, 1.50)</td>
</tr>
<tr>
<td>Trust in physicians</td>
<td><strong>0.98 (0.97, 0.99)</strong></td>
<td>0.99 (0.98, 1.01)</td>
</tr>
<tr>
<td>Heart failure knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td><strong>0.40 (0.30, 0.60)</strong></td>
<td><strong>0.50 (0.30, 0.72)</strong></td>
</tr>
<tr>
<td>Low (ref)</td>
<td>1.00 (0.70, 1.50)</td>
<td>1.00 (0.70, 1.50)</td>
</tr>
</tbody>
</table>

*Participants with BMI >18.5 are excluded from analysis.
Adjusted by age, race, income, education, marital status, insurance status, body mass index, length of time with heart failure diagnosis, depression, hospital type, insurance status, number of comorbidities, heart failure severity, heart failure self-efficacy, type of doctor, social support, trust in physicians, medication adherence, and heart failure sign and symptom knowledge.
Bold ORs have p-value <0.05
1 OR of 1.00 due to rounding
A cut point of 70 is used to classify participants having an "adequate" or "inadequate" self-care total score; Riegel, B., Lee, C.S., Dickson, V.V., & Carlson B., (2009)
Table 9: Unadjusted and adjusted logistic regression results for odds of inadequate self-care maintenance

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Unadjusted</th>
<th>Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O.R (95% CI)</td>
<td>O.R (95% CI)</td>
</tr>
<tr>
<td><strong>Clinical factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body Mass Index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>2.01 (1.40, 3.00)</td>
<td>1.70 (1.10, 2.64)</td>
</tr>
<tr>
<td>Overweight</td>
<td>1.50 (0.95, 2.24)</td>
<td>1.40 (0.90, 2.23)</td>
</tr>
<tr>
<td>Normal weight (ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of time with heart failure diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year (ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 years</td>
<td>1.10 (0.70, 1.70)</td>
<td>1.10 (0.64, 1.80)</td>
</tr>
<tr>
<td>3-5 years</td>
<td>0.75 (0.50, 1.24)</td>
<td>0.73 (0.42, 1.30)</td>
</tr>
<tr>
<td>&gt; 5 years</td>
<td>0.70 (0.42, 1.02)</td>
<td>0.74 (0.50, 1.21)</td>
</tr>
<tr>
<td>Hospital type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety-net</td>
<td>1.90 (1.21, 2.98)</td>
<td>1.20 (0.70, 1.95)</td>
</tr>
<tr>
<td>Regional referral center</td>
<td>0.90 (0.62, 1.30)</td>
<td>0.94 (0.64, 1.40)</td>
</tr>
<tr>
<td>Teaching (ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of comorbidities</td>
<td>1.10 (0.98, 1.20)</td>
<td>1.04 (0.94, 1.14)</td>
</tr>
<tr>
<td>Heart failure severity</td>
<td>0.99 (0.98, 0.99)</td>
<td>0.99 (0.98, 1.01)</td>
</tr>
<tr>
<td>Type of doctor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary-care</td>
<td>0.60 (0.41, 0.80)</td>
<td>0.70 (0.50, 0.99)</td>
</tr>
<tr>
<td>Cardiologist (ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychosocial factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-efficacy for heart failure self-care</td>
<td>0.98 (0.98, 0.99)</td>
<td>0.99 (0.98, 0.99)</td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.80 (1.30, 2.40)</td>
<td>1.10 (0.80, 1.60)</td>
</tr>
<tr>
<td>No (ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>0.50 (0.33, 0.73)</td>
<td>0.70 (0.43, 1.10)</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.64 (0.43, 0.96)</td>
<td>0.80 (0.50, 1.20)</td>
</tr>
<tr>
<td>Low (ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trust in physicians</td>
<td>0.98 (0.97, 1.00)¹</td>
<td>0.99 (0.98, 1.01)</td>
</tr>
<tr>
<td>Heart failure knowledge</td>
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<td></td>
</tr>
<tr>
<td>High</td>
<td>0.83 (0.60, 1.21)</td>
<td>0.83 (0.54, 1.30)</td>
</tr>
<tr>
<td>Low (ref)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Participants with BMI >18.5 are excluded from analysis.
Adjusted by age, race, income, education, marital status, insurance status, body mass index, length of time with heart failure diagnosis, depression, hospital type, insurance status, number of comorbidities, heart failure severity, heart failure self-efficacy, type of doctor, social support, trust in physicians, medication adherence, and heart failure sign and symptom knowledge.
Bold ORs have p-value <0.05
¹ OR of 1.00 due to rounding
A cut point of 70 is used to classify participants having an “adequate” or “inadequate” self-care maintenance score; Riegel, B., Lee, C.S., Dickson, V.Y., & Carlson B., (2009)
Table 10: Unadjusted and adjusted logistic regression results for odds of inadequate self-care management

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Unadjusted O.R (95% CI)</th>
<th>Adjusted O.R (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clinical factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body Mass Index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>0.74 (0.50, 1.11)</td>
<td>1.10 (0.70, 1.72)</td>
</tr>
<tr>
<td>Overweight</td>
<td>0.81 (0.52, 1.30)</td>
<td>1.03 (0.64, 1.70)</td>
</tr>
<tr>
<td>Normal weight (ref)</td>
<td></td>
<td></td>
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<tr>
<td>Length of time with heart failure diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year (ref)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 years</td>
<td>0.80 (0.50, 1.30)</td>
<td>0.90 (0.34, 1.50)</td>
</tr>
<tr>
<td>3-5 years</td>
<td>0.41 (0.30, 0.70)</td>
<td>0.50 (0.30, 0.80)</td>
</tr>
<tr>
<td>&gt; 5 years</td>
<td>0.62 (0.40, 0.98)</td>
<td>0.71 (0.43, 1.20)</td>
</tr>
<tr>
<td>Hospital type</td>
<td></td>
<td></td>
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<tr>
<td>Safety-net</td>
<td>1.14 (0.80, 1.73)</td>
<td>1.20 (0.74, 1.98)</td>
</tr>
<tr>
<td>Regional referral center</td>
<td>0.90 (0.64, 1.30)</td>
<td>0.93 (0.63, 1.40)</td>
</tr>
<tr>
<td>Teaching (ref)</td>
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<td></td>
</tr>
<tr>
<td>Number of comorbidities</td>
<td>0.90 (0.82, 0.96)</td>
<td>0.90 (0.81, 0.98)</td>
</tr>
<tr>
<td>Heart failure severity</td>
<td>1.00 (1.00, 1.01)</td>
<td>1.00 (0.99, 1.01)</td>
</tr>
<tr>
<td>Type of doctor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiologist</td>
<td>0.83 (0.61, 1.13)</td>
<td>0.94 (0.70, 1.33)</td>
</tr>
<tr>
<td>Primary-care (ref)</td>
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<tr>
<td><strong>Psychosocial factors</strong></td>
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<td></td>
</tr>
<tr>
<td>Self-efficacy for heart failure self-care</td>
<td>0.98 (0.97, 0.99)</td>
<td>0.98 (0.97, 0.99)</td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0.80 (0.60, 1.02)</td>
<td>0.80 (0.53, 1.20)</td>
</tr>
<tr>
<td>No (ref)</td>
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<td></td>
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<tr>
<td>Social support</td>
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<td></td>
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<tr>
<td>High</td>
<td>0.70 (0.50, 0.98)</td>
<td>0.83 (0.52, 1.30)</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.80 (0.50, 1.12)</td>
<td>0.84 (0.52, 1.30)</td>
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<td>Low (ref)</td>
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</tr>
<tr>
<td>Trust in physicians</td>
<td>0.99 (0.97, 0.99)</td>
<td>0.99 (0.98, 1.00)</td>
</tr>
<tr>
<td>Heart failure knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>0.34 (0.24, 0.50)</td>
<td>0.50 (0.31, 0.73)</td>
</tr>
<tr>
<td>High (ref)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Participants with BMI >18.5 are excluded from analysis. Adjusted by age, race, income, education, marital status, insurance status, body mass index, length of time with heart failure diagnosis, depression, hospital type, insurance status, number of comorbidities, heart failure severity, heart failure self-efficacy, type of doctor, social support, trust in physicians, medication adherence, and heart failure sign and symptom knowledge. Bold ORs have p-value <0.05 OR of 1.00 due to rounding A cut point of 70 is used to classify participants having an “adequate” or “inadequate” self-care management score; Riegel, B., Lee, C.S., Dickson, V.V., & Carlson B., (2009)
Table 11: Proportion of heart failure participants practicing self-care maintenance behaviors stratified by BMI category: Never or rarely response category

<table>
<thead>
<tr>
<th>Self-care maintenance behavior</th>
<th>BMI Category</th>
<th>p-value (^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal weight &gt;18.5-24.9 kg/m(^2) (n=154)</td>
<td>Overweight &gt;24.9-29.9 kg/m(^2) (n=197)</td>
</tr>
<tr>
<td>Daily Weigh-in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never or rarely</td>
<td>54 (35)</td>
<td>63 (32)</td>
</tr>
<tr>
<td>Eating Low salt diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never or rarely</td>
<td>21 (14)</td>
<td>17 (9)</td>
</tr>
<tr>
<td>Daily Physical Activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never or rarely</td>
<td>68 (44)</td>
<td>94 (49)</td>
</tr>
<tr>
<td>Keeping Weight Down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never or rarely</td>
<td>14 (9)</td>
<td>23 (12)</td>
</tr>
<tr>
<td>Getting Yearly Flu shot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never or rarely</td>
<td>28 (18)</td>
<td>40 (21)</td>
</tr>
</tbody>
</table>

\(^1\) p-value of .05 used to determine statistical significance
Table 12: Results of tests for interaction between social support and BMI in total self-care, self-care maintenance and self-care management models.

<table>
<thead>
<tr>
<th>Self-care type</th>
<th>p-value(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate self-care total score</td>
<td>0.22</td>
</tr>
<tr>
<td>Inadequate self-care maintenance</td>
<td>0.82</td>
</tr>
<tr>
<td>Inadequate self-care management</td>
<td>0.20</td>
</tr>
</tbody>
</table>

\(^1\) a p-value < .10 used to indicate statistical significance.

*Participants with BMI >18.5 are excluded from analysis.

A cut point of 210 is used to classify participants having a “adequate” or “inadequate” total self-care score; Riegel, B., Lee, C.S., Dickson, V.V., & Carlson B., (2009)

A cut point of 70 is used to classify participants having an “adequate” or “inadequate” self-care management and maintenance scores; Riegel, B., Lee, C.S., Dickson, V.V., & Carlson B., (2009)

Adjusted for age, race, income, education, marital status, insurance status, body mass index, length of time with heart failure diagnosis, depression, hospital type, insurance status, number of comorbidities, heart failure severity, heart failure self-efficacy, type of doctor, social support, trust in physicians, medication adherence and heart failure sign and symptom knowledge in each model.

Bold ORs have p-value <0.05.
Figure 1: Conceptual model of the relationship between weight status and self-care behaviors

**Psychosocial factors**
- Social Support
- Self-care knowledge

**Clinical factors**
- Heart failure severity
- Number of comorbidities

**Sociodemographic factors**
- Age
- Race
- Gender

Demographic Profile of African-American and Caucasian heart failure participants

Weight Status (BMI)

Self-care
- Self-efficacy
- Management
- Maintenance
Figure 2: Heart Failure Self-Care Model

Self-Care of Heart Failure Model

Figure 2: Visual depiction of the heart failure self-care process (on the basis of Riegel, Carlson, Moser, Sebern, Hicks, & Roland, 2004). Adapted from “Self Care of Heart Failure Index. Retrieved June 12, 2013 from http://www.self-careofheartfailureindex.com/”
Figure 3: Flowchart describing definition of the study population

- 736 participants enrolled at baseline for SSPAN-HF, PUSSH, and DCH-SSS
  - 2 excluded because of age restriction (< 40)

- 734 participants
  - 8 excluded because of missing responses for income

- 726 participants
  - 8 excluded because of missing physician trust scores

- 718 participants
  - 5 excluded because of missing depression scores

- 713 participants
  - 4 excluded because of missing height and weight measurements to calculate BMI

- 709 participants
  - 2 excluded because of missing responses for insurance coverage

- 707 participants
  - 2 excluded because of missing responses for completed education

- 705 participants
  - 1 excluded because of missing heart failure severity data from KCCQ

- 704 participants
  - 0 participants excluded because they were asymptomatic

- 704 participants
  - 14 participants excluded because BMI < 18.5 kg/m²

- 690 participants in final study population for dissertation analyses
Proportion of heart failure participants in each perceived social support category stratified by weight status

- Low social support
- Moderate social support
- High social support

BMI category:
- Normal weight
- Overweight
- Obese

% of patients
Proportion of heart failure participants in high and low self-care knowledge categories stratified by weight status

BMI category

- Normal weight
- Overweight
- Obese

% of patients

- High self-care knowledge
- Low self-care knowledge
Figure 6

Proportion of participants with low self-care total score stratified by weight status

<table>
<thead>
<tr>
<th>BMI Category</th>
<th>% of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal weight</td>
<td>60</td>
</tr>
<tr>
<td>Overweight</td>
<td>70</td>
</tr>
<tr>
<td>Obese</td>
<td>80</td>
</tr>
</tbody>
</table>
APPENDIX A

SOCIAL SUPPORT, PATIENTS’ NEEDS, AND HOSPITAL USE FOR HEART FAILURE, SSPAN-HF PROJECT, BASELINE SURVEY
Social Support, Patients’ Needs, and Hospital Use for Heart Failure, SSPAN-HF Project, Baseline Survey

Survey Preamble
Thank you for agreeing to participate in the survey. As I mentioned, it will take about 45 minutes to complete. Remember that there are no right or wrong answers. We only want you to answer the questions as best you can. If you need me to repeat any questions or answer choices, please let me know. If you have any questions or concerns during the survey, please let me know. Let’s begin.
Social Support, PATients Needs, and Hospital Use for Heart Failure, SSPAN-HF Project, Baseline Survey

HISTORY OF HEART FAILURE

The first topic we will cover will be your history of heart failure. The following items will focus on how long you have had heart failure and how many times you recently needed to go into the hospital for heart failure.

1. Has a doctor or nurse ever told you that you had “heart failure”, “congestive heart failure”, or “pump failure”?  
   - Yes
   - No
   - Don’t know/Not sure

2. How long ago did a doctor or nurse first tell you that you had “heart failure”, “congestive heart failure”, or “pump failure”?
   - Less than 1 year ago
   - Between 1 and 3 years ago
   - Between 3 and 5 years ago
   - More than 5 years ago
   - Don’t know/Not sure

HOSPITAL USE FOR HEART FAILURE

3. Were you hospitalized for HEART FAILURE at UAB Hospital in the year 2008 (between 1/1/2008 and 12/31/2008)?
   - Yes
   - If “yes”, go to item 4.
   - No
   - If “no”, skip item 4 and go to item 5.
   - Don’t know/Not sure
   - If “don’t know/not sure”, skip item 4 and go to item 5.

4. If so, how many times have you been hospitalized for HEART FAILURE at UAB Hospital in the year 2008 (between 1/1/2008 and 12/31/2008)?
   - 0
   - If “0”, go to item 6.
   - 1
   - If “1”, go to item 6.
   - 2
   - If “2”, go to item 6.
   - 3
   - If “3”, go to item 6.
   - 4
   - If “4”, go to item 6.
   - 5
   - If “5”, go to item 6.
   - 6
   - If “6”, go to item 6.
   - 7
   - If “7”, go to item 6.
   - 8
   - If “8”, go to item 7.
   - 9
   - If “9”, go to item 7.
   - >10
   - If “>10”, go to item 7.
   - Don’t know/Not sure
   - If “don’t know/not sure”, skip item 4 and go to item 7.

5. Were you hospitalized for HEART FAILURE at any hospitals other than UAB Hospital in the year 2008 (between 1/1/2008 and 12/31/2008)?
   - Yes
   - If yes, go to item 6.
   - No
   - If no, skip item 6 and go to item 7.
   - Don’t know/Not sure
   - If “don’t know/not sure”, skip item 6 and go to item 7.
6. If so, how many times have you been hospitalized for HEART FAILURE at any hospitals other than UAB Hospital in the year 2008 (between 1/1/2008 and 12/31/2008)?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

☐ 8 ☐ 9 ☐ >10
☐ Don’t know/Not sure

ALL-CAUSE HOSPITAL USE

7. Were you hospitalized for ANY REASON OTHER THAN HEART FAILURE at UAB Hospital in the year 2008 (between 1/1/2008 and 12/31/2008)?

☐ Yes → If yes, go to item 8.

☐ No → If no, skip item 8 and go to item 9.

☐ Don’t know/Not sure → If don’t know/not sure, skip item 8 and go to item 9.

8. If so, how many times have you been hospitalized for ANY REASON OTHER THAN HEART FAILURE at UAB Hospital in the year 2008 (between 1/1/2008 and 12/31/2008)?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ >10

☐ Don’t know/Not sure

9. Were you hospitalized for ANY REASON OTHER THAN HEART FAILURE at any hospitals other than UAB Hospital in the year 2008 (between 1/1/2008 and 12/31/2008)

☐ Yes → If yes, go to item 10.

☐ No → If no, skip item 10 and go to item 11.

☐ Don’t know/Not sure → If don’t know/not sure, skip item 10 and go to item 11.

10. If so, how many times have you been hospitalized for ANY REASON OTHER THAN HEART FAILURE at any hospitals other than UAB Hospital in the year 2008 (between 1/1/2008 and 12/31/2008)?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ >10

☐ Don’t know/Not sure
KNOWLEDGE OF HEART FAILURE (DeWalt Knowledge of CHF questionnaire)

I would like to find out how much you know about heart failure and its treatment. I'm going to read questions and some possible answers. Tell me which answer you think is correct. If you don't know the answer, don't worry, you can just say "I don't know." If you need me to repeat any answer choices, please don't hesitate to ask me.

11. Heart failure means that:
   - a. your heart is beating out of rhythm
   - b. your heart might stop beating sometime soon
   - c. your heart is not pumping blood as well as it should, OR
   - d. you are having a heart attack
   - e. DON'T KNOW

12. Which of the following symptoms can come from your heart failure? Choose only one answer
   - a. headache
   - b. yellowing of the skin
   - c. shortness of breath when you lay down flat
   - d. DON'T KNOW

I'm going to read a list of problems, and I want you to tell me if each one is a sign your heart failure is getting worse. If you don't know the answer, you can just say "I don't know." Again, if you need me to repeat any answer choices, please don't hesitate to ask me.

13. Which of the following are signs that you are dehydrated (meaning you have lost too much water)?
   - a. dizziness
   - b. shortness of breath
   - c. chest pain
   - d. peeing a lot
14. Is shortness of breath a sign your heart failure is getting worse?
   □ a. YES
   □ b. NO
   □ c. DON'T KNOW

15. Is swelling of the legs or ankles a sign your heart failure is getting worse?
   □ a. YES
   □ b. NO
   □ c. DON'T KNOW

16. What about yellowing of the skin? PROBE: Is yellowing of the skin a sign your heart failure is getting worse?
   □ a. YES
   □ b. NO
   □ c. DON'T KNOW

17. Waking up at night short of breath? PROBE: Is waking up at night short of breath a sign your heart failure is getting worse?
   □ a. YES
   □ b. NO
   □ c. DON'T KNOW

18. Vomiting blood? PROBE: Is vomiting blood a sign your heart failure is getting worse?
   □ a. YES
   □ b. NO
   □ c. DON'T KNOW

19. Headaches? PROBE: Are headaches a sign your heart failure is getting worse?
   □ a. YES
   □ b. NO
   □ c. DON'T KNOW
KNOWLEDGE OF HEART FAILURE (continued)

20. Weight gain? PROBE: Is gaining weight a sign your heart failure is getting worse?
   □ a. YES
   □ b. NO
   □ c. DON’T KNOW

21. If you eat a lot of salt, it will:
   □ a. make your heart failure worse
   □ b. make your heart failure better
   □ c. have no effect on your heart failure
   □ d. DON’T KNOW

22. What should you do when you feel more short of breath and your weight has increased by 6 lb from your good weight?
   □ a. stop taking your fluid pill
   □ b. call your doctor
   □ c. go on a diet
   □ d. weigh yourself tomorrow to see if you have gained more
   □ e. DON’T KNOW

23. What should you do when your legs swell up more than normal?
   □ a. take an extra dose of your fluid pill
   □ b. walk more
   □ c. eat more salt
   □ d. eat more protein
   □ e. DON’T KNOW
24. Compared to someone without heart failure, a person with heart failure should drink:
   a. more fluids than usual
   b. about the same amount of fluids, or
   c. less fluids than usual
   d. DON’T KNOW

25. Someone with heart failure should weigh himself or herself:
   a. every day
   b. once a week
   c. once a month, or
   d. only if he or she feels badly
   e. DON’T KNOW

*D.A. DeWalt et al. / Patient Education and Counseling 55 (2004) 78–86*
SEVERITY OF HEART FAILURE AND HEALTH STATUS AND FUNCTIONAL STATUS RELATED TO HEART FAILURE (Kansas City Cardiomyopathy Questionnaire)

Great! We are finished with that set of questions. Now we will move on to questions related to how your heart failure makes you feel physically. The answers to this group of questions are multiple choice and those choices will change from question-to-question. I need you to listen carefully to the questions and the answer choices.

Heart Failure affects different people in different ways. Some feel shortness of breath while others feel fatigue. Please indicate how much you are limited by heart failure (shortness of breath or fatigue) in your ability to do the following activities over the past 2 weeks.

<table>
<thead>
<tr>
<th></th>
<th>Extremely limited</th>
<th>Quite a bit Limited</th>
<th>Moderately Limited</th>
<th>Slightly Limited</th>
<th>Not at all Limited</th>
<th>Limited for other reasons or did not do the activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. Dressing yourself</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>27. Showering/Bathing</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>28. Walking 1 block on level ground</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>29. Doing yardwork, housework, or carrying groceries</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>30. Climbing a flight of stairs without stopping</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>31. Hurrying or jogging (as if to catch a bus)</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>
32. **Compared with 2 weeks ago**, have your symptoms of **heart failure** (shortness of breath, fatigue or ankle swelling) changed? Your symptoms of **heart failure** have become . . .

- Much worse  
- Slightly worse  
- Not changed  
- Slightly better  
- Much better  

You’ve had no symptoms over the last 2 weeks.

33. Over the **past 2 weeks**, how many times did you have **swelling** in your feet, ankles or legs when you woke up in the morning?

- Every morning  
- 3 or more times a week, but not every day  
- 1–2 times a week  
- Less than once a week  
- Never over the past 2 weeks

34. Over the **past 2 weeks**, how much has **swelling** in your feet, ankles or legs bothered you?

- Extremely bothersome  
- Quite a bit bothersome  
- Moderately bothersome  
- Slightly bothersome  
- Not at all bothersome

You’ve had no swelling.

35. Over the **past 2 weeks**, on average, how many times has **fatigue** limited your ability to do what you want?

- All of the time  
- Several times  
- At least once a day  
- 3 or more times per day but not every day  
- 1–2 times per week  
- Less than once a week  
- Never over the past 2 weeks

Over the **past 2 weeks**, on average, how many times has **fatigue** limited your ability to do what you want?
SEVERITY OF HEART FAILURE AND HEALTH STATUS AND FUNCTIONAL STATUS RELATED TO HEART FAILURE (continued)

36. Over the past 2 weeks, how much has your fatigue bothered you?

It has been . . .

<table>
<thead>
<tr>
<th>Extremely bothersome</th>
<th>Quite a bit bothersome</th>
<th>Moderately bothersome</th>
<th>Slightly bothersome</th>
<th>Not at all bothersome</th>
<th>You’ve had no fatigue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

37. Over the past 2 weeks, on average, how many times has shortness of breath limited your ability to do what you wanted?

<table>
<thead>
<tr>
<th>All of the time per day</th>
<th>Several times per day</th>
<th>At least once a day</th>
<th>3 or more times per week</th>
<th>1–2 times per week</th>
<th>Less than once a week but not every day</th>
<th>Never over the past 2 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

38. Over the past 2 weeks, how much has your shortness of breath bothered you?

It has been . . .

<table>
<thead>
<tr>
<th>Extremely bothersome</th>
<th>Quite a bit bothersome</th>
<th>Moderately bothersome</th>
<th>Slightly bothersome</th>
<th>Not at all bothersome</th>
<th>You’ve had no shortness of breath</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SEVERITY OF HEART FAILURE AND HEALTH STATUS AND FUNCTIONAL STATUS RELATED TO HEART FAILURE (continued)

39. Over the past 2 weeks, on average, how many times have you been forced to sleep sitting up in a chair or with at least 3 pillows to prop you up because of shortness of breath?

- Every morning
- 3 or more times a week, but not every day
- 1–2 times a week
- Less than once a week
- Never over the past 2 weeks

40. Heart failure symptoms can worsen for a number of reasons. How sure are you that you know what to do, or whom to call, if your heart failure gets worse?

- Not at all sure
- Not very sure
- Somewhat sure
- Mostly sure
- Completely sure

41. How well do you understand what things you are able to do to keep your heart failure symptoms from getting worse? (for example, weighing yourself, eating a low salt diet, etc.)

- Do not understand at all
- Do not understand very well
- Somewhat understand
- Mostly understand
- Completely understand

42. Over the past 2 weeks, how much has your heart failure limited your enjoyment of life?

- It has extremely limited your enjoyment of life
- It has limited your enjoyment of life quite a bit
- It has limited your enjoyment of life moderately
- It has slightly limited your enjoyment of life
- It has not limited your enjoyment of life
SEVERITY OF HEART FAILURE AND HEALTH STATUS AND FUNCTIONAL STATUS RELATED TO HEART FAILURE (continued)

43. If you had to spend the rest of your life with your heart failure the way it is right now, how would you feel about this?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Mostly satisfied</th>
<th>Slightly satisfied</th>
<th>Moderately satisfied</th>
<th>Severely limited</th>
</tr>
</thead>
<tbody>
<tr>
<td>satisfied</td>
<td>dissatisfied</td>
<td>satisfied</td>
<td>satisfied</td>
<td></td>
</tr>
</tbody>
</table>

44. Over the past 2 weeks, how often have you felt discouraged or down in the dumps because of your heart failure?

<table>
<thead>
<tr>
<th>You felt that way</th>
<th>You occasionally felt that way</th>
<th>You rarely felt that way</th>
<th>You never felt that way</th>
</tr>
</thead>
<tbody>
<tr>
<td>all of the time</td>
<td>most of the time</td>
<td>way</td>
<td>way</td>
</tr>
</tbody>
</table>

How much does your heart failure affect your lifestyle? Please indicate how your heart failure may have limited your participation in the following activities over the past 2 weeks.

45. Hobbies, recreational activities

<table>
<thead>
<tr>
<th>Severe</th>
<th>Limited</th>
<th>Moderately</th>
<th>Slightly</th>
<th>Did not apply or did not do for other reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severely</td>
<td>Limited</td>
<td>Moderately</td>
<td>Slightly</td>
<td>Did not apply or did not do for other reasons</td>
</tr>
<tr>
<td>quite a bit</td>
<td>limited</td>
<td>limited</td>
<td>limited</td>
<td></td>
</tr>
<tr>
<td>limit at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hobbies</th>
<th>recreational activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severely</td>
<td></td>
</tr>
<tr>
<td>Limited</td>
<td></td>
</tr>
<tr>
<td>did not</td>
<td></td>
</tr>
<tr>
<td>quite a bit</td>
<td></td>
</tr>
<tr>
<td>limit at all</td>
<td></td>
</tr>
</tbody>
</table>
46. Working or doing household chores

47. Visiting family or friends out of your home

48. Intimate relationships with loved ones

SEVERITY OF HEART FAILURE AND HEALTH STATUS AND FUNCTIONAL STATUS RELATED TO HEART FAILURE (continued)

Severely limited

Limited quite a bit

Moderately limited

Slightly limited

Did not limit at all

Does not apply or did not do for other reasons


Okay that set of questions was probably the hardest to follow with all of the multiple choice questions. Let's just take a 10-second mental break and then we will move on with the rest of the survey. [Pause for 10 seconds for break]. The next group of questions will focus on what you do at home to manage your heart failure. The next set of questions are multiple choice, too, but the answer choices are more consistent. If you need me to repeat any answer choices, please don't hesitate to ask me.
## ADHERENCE TO SELF-MANAGEMENT BEHAVIORS

(Reigel Heart Failure Self-Care Index)

I will list some common recommendations for persons with heart failure. How often do you do the following?

<table>
<thead>
<tr>
<th></th>
<th>Never or rarely</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>49.</td>
<td>Weigh yourself daily?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>50.</td>
<td>Eat a low salt diet?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>51.</td>
<td>Take part in regular physical activity?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>52.</td>
<td>Keep your weight down?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>53.</td>
<td>Get a flu shot every year?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Many patients have symptoms due to their heart failure. Trouble breathing and ankle swelling are common symptoms of heart failure.

54. In the past 3 months, have you had trouble breathing or ankle swelling?

☐ Yes

☐ No

The **LAST TIME** you had trouble breathing or ankle swelling,

<table>
<thead>
<tr>
<th></th>
<th>You did not recognize it</th>
<th>Not quickly</th>
<th>Somewhat quickly</th>
<th>Quickly</th>
<th>Very quickly</th>
</tr>
</thead>
<tbody>
<tr>
<td>55.</td>
<td>How quickly did you recognize it as a symptom of heart failure?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
ADHERENCE TO SELF-MANAGEMENT BEHAVIORS (continued)

I will list some remedies that people with heart failure use. When you have trouble breathing or ankle swelling, how likely are you to try one of these remedies? (Circle one number for each remedy)

<table>
<thead>
<tr>
<th></th>
<th>Not Likely</th>
<th>Somewhat Likely</th>
<th>Likely</th>
<th>Very Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>56.</td>
<td>Reduce the salt in your diet</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>57.</td>
<td>Reduce your fluid intake</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>58.</td>
<td>Take an extra water pill</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>59.</td>
<td>Call your doctor or nurse for guidance</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

If you tried any of these remedies the last time you had trouble breathing or ankle swelling,

<table>
<thead>
<tr>
<th></th>
<th>I did not try anything</th>
<th>Not sure</th>
<th>Somewhat sure</th>
<th>Sure</th>
<th>Very Sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>60.</td>
<td>How sure were you that the remedy helped or not?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Not confident</th>
<th>Somewhat confident</th>
<th>Very confident</th>
<th>Extremely confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>61.</td>
<td>How confident are you that you can evaluate the importance of your own symptoms?</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Not confident</th>
<th>Somewhat confident</th>
<th>Very confident</th>
<th>Extremely confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>62.</td>
<td>Generally, how confident are you that you can recognize changes in your health if they occur?</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
ADHERENCE TO SELF-MANAGEMENT BEHAVIORS (continued)


SOCIAL SUPPORT

The following questions are related to the social support that you receive at home. While some of the questions in this section may seem to repeat, please remember that some questions may be asked in different ways in order to help us gather similar information.

The next group of questions is all multiple choice, but the choices are the same for each question. If you need me to repeat any questions or answer choices, please don’t hesitate to ask me.

Medical Outcomes Survey – Social Support Survey (MOS-SSS)

People sometimes look to others for companionship, assistance, or other types of support. How often is each of the following kinds of support available to you if you need it?

<table>
<thead>
<tr>
<th></th>
<th>None of the time</th>
<th>A little of the time</th>
<th>Some of the time</th>
<th>Most of the time</th>
<th>All of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Emotional/informational support]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65. Someone you can count on to listen to you when you need to talk</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66. Someone to give you information to help you understand a situation</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Question</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>67.</td>
<td>Someone to give you good advice about a crisis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68.</td>
<td>Someone to confide in or talk to about yourself or your problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>69.</td>
<td>Someone whose advice you really want</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70.</td>
<td>Someone to share your most private worries and fears with</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>71.</td>
<td>Someone to turn to for suggestions about how to deal with a personal problem</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72.</td>
<td>Someone who understands your problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>[Tangible support]</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>73.</td>
<td>Someone to help you if you were confined to bed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74.</td>
<td>Someone to take you to the doctor if you needed it</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75.</td>
<td>Someone to prepare your meals if you were unable to do it yourself</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>76.</td>
<td>Someone to help with daily chores if you were sick</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>[Affectionate support]</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77.</td>
<td>Someone who shows you love and affection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>78.</td>
<td>Someone to love and make you feel wanted</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>79.</td>
<td>Someone who hugs you</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>[Positive social interaction]</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80.</td>
<td>Someone to have a good time with</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>81.</td>
<td>Someone to get together with for relaxation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>82.</td>
<td>Someone to do something enjoyable with</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Additional item

83. Someone to do things with to help you get your mind off things  1  2  3  4  5


Multidimensional Perceived Social Support Scale (MPSSS)

Please listen to each statement and let me know the response most appropriate for you.

1 = STRONGLY DISAGREE
2 = DISAGREE
3 = SOMEWHAT DISAGREE
4 = NEUTRAL
5 = SOMEWHAT AGREE
6 = AGREE
7 = STRONGLY AGREE

84. There is a special person who is around when you are in need.  1  2  3  4  5  6  7

85. There is a special person with whom you can share your joys and sorrows.  1  2  3  4  5  6  7

86. Your family really tries to help you.  1  2  3  4  5  6  7

87. You get the emotional help and support that you need from your family.  1  2  3  4  5  6  7

88. You have a special person who is a real source of comfort to you.  1  2  3  4  5  6  7

89. Your friends really try to help you.  1  2  3  4  5  6  7

90. You can count on your friends when things go wrong.  1  2  3  4  5  6  7

91. You can talk about your problems with your family.  1  2  3  4  5  6  7

92. You have friends with whom you share your joys and sorrows.  1  2  3  4  5  6  7

93. There is a special person in your life who cares about your feelings.  1  2  3  4  5  6  7

94. Your family is willing to help you make  1  2  3  4  5  6  7
decisions.

95. You can talk about your problems with your friends.

Zimet, GD. Journal of Personality Assessment. 1988, 52(1):30-4

Thank you for hanging in there so far. You are doing great. We are coming to the home stretch. Just a few more minutes and we will be done.

Cohen Perceived Stress Scale (PSS)

The next four items deal with how you have felt in the last month. They are multiple choice. If

<table>
<thead>
<tr>
<th>Never</th>
<th>Almost Never</th>
<th>Sometimes</th>
<th>Fairly Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

96. In the last month, how often have you felt that you were unable to control the important things in your life?

97. In the last month, how often have you felt confident about your ability to handle your personal problems?

98. In the last month, how often have you felt that things were going your way?

99. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

you need me to repeat any questions or answer choices, please don’t hesitate to ask me.

TRUST IN PHYSICIANS (Primary Care Assessment Survey Trust Subscale)

When answering the following 8 items, please think of your personal doctor or nurse. If you do not have a personal doctor or nurse, please think of the doctor, physician assistant or nurse that you have seen most often in the past 12 months. These are multiple choice, but the answer choices are the same for each question. If you need me to repeat any questions or answer choices, please don’t hesitate to ask me.

100. You can tell your health care provider anything.
101. Your health care provider sometimes pretends to know things when he/she is not sure.
   □ Strongly Agree
   □ Agree
   □ Do not know
   □ Disagree
   □ Strongly disagree

TRUST IN PHYSICIANS (continued)

102. You completely trust your health care provider’s judgments about your medical care.
   □ Strongly Agree
   □ Agree
   □ Do not know
   □ Disagree
   □ Strongly disagree

103. Your health care provider cares more about holding costs down than about doing what is needed for your health.
   □ Strongly Agree
   □ Agree
   □ Do not know
   □ Disagree
   □ Strongly disagree

104. Your health care provider would always tell you the truth about your health, even if there was bad news.
   □ Strongly Agree
   □ Agree
   □ Do not know
   □ Disagree
   □ Strongly disagree

105. Your health care provider cares as much as you do about your health.
   □ Strongly Agree
If a mistake was made in your treatment, your health care provider would try to hide it from you.

- Strongly Agree
- Agree
- Do not know
- Disagree
- Strongly disagree

TRUST IN PHYSICIANS (continued)

All things considered, how much do you trust your health care provider? Please use the following scale below.

1 2 3 4 5 6 7 8 9 10

Not at all Completely


DEPRESSION (Medical Outcomes Survey-Depression questionnaire [MOS-D])

The following questions are related to your general mood. The first few will be multiple choice while the last three will be “yes” or “no” questions. If you need me to repeat any questions or answer choices, please don’t hesitate to ask me.
**MEDICATION ADHERENCE** (Morisky Scale of Medication Adherence)

The next few questions will focus on how you take your medications. If you need me to repeat any questions or answer choices, please don’t hesitate to ask me.

“Thinking of the medications PRESCRIBED to you by your doctor(s), please answer the following questions.”

<table>
<thead>
<tr>
<th>During the past week:</th>
<th>Rarely or none of the time (less than 1 day)</th>
<th>Some or a little of the time (1-2 days)</th>
<th>Occasionally or a moderate amount of time (3-4 days)</th>
<th>Most or all of the time (5-7 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>108. You felt depressed.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>109. Your sleep was restless.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>110. You enjoyed life.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>111. You had crying spells.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>112. You felt sad.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>113. You felt that people disliked you</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>114. In the past year, have you had 2 weeks or more that you felt sad, blue, depressed, or lost pleasure in things that you usually cared about or enjoyed?</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>115. Have you had 2 years or more in your life when you felt depressed or sad most days, even if you felt okay sometimes?</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>(If yes to above): Have you felt depressed or sad much of the time in the past year?</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

Never | Rarely | Sometimes | Often | Always
--- | --- | --- | --- | ---
117. Do you ever forget to take your medications? | 0 | 1 | 2 | 3 | 4
118. Are you careless at times about taking your medications? | 0 | 1 | 2 | 3 | 4
119. When you feel better, do you sometimes stop taking your | 0 | 1 | 2 | 3 | 4
medications?

120. Sometimes, if you feel worse when you take your medications, do you stop taking them?

0 1 2 3 4


CHARACTERISTICS OF OUTPATIENT CARE

Now I am going to ask you about some general health issues other than heart failure.

121. Do you have a place where you normally seek medical care when you are sick or for regular check-ups?

□ Yes ► If yes, go to item 122

□ No ► If no, skip items 122 and 123, and go to item 124

122. Is that place where you seek medical care a:

□ Doctor’s office

□ Clinic

□ Health Center

□ Emergency Department or Emergency Room

□ Other ________________________________

123. What type of doctor do you see most for your heart failure? Probe: In other words, what type of doctor is primarily responsible for monitoring your heart failure and adjusting your heart failure medications?

□ Primary care practitioner (examples include internal medicine doctor, general practitioner, or family practice doctor)

□ Cardiologist or heart specialist

HEALTH CHARACTERISTICS

Again, the next few questions are related to your general health.

124. What is your current weight (in lbs)?

______________________________
The following are just “yes” or “no” questions still related to medical problems other than heart failure.

Has a doctor or a nurse told you that you have any of the following medical problems?

126. □ Yes □ No  High blood pressure or Hypertension
127. □ Yes □ No  Heart attack or myocardial infarction
128. □ Yes □ No  Valvular disease (heart valve problems)
129. □ Yes □ No  Diabetes (high blood sugar)
130. □ Yes □ No  Asthma, emphysema, or other chronic lung problem
131. □ Yes □ No  Depression and/or anxiety
132. □ Yes □ No  Stroke or mini stroke (Cerebrovascular accident [CVA] or transient ischemic attack [TIA])
133. □ Yes □ No  Kidney disease or kidney failure requiring dialysis
134. □ Yes □ No  Abnormal heart rhythm, arrhythmia, or currently have a pacemaker
135. □ Yes □ No  A weight problem (obesity)
136. □ Yes □ No  Cancer (other than skin cancer)
137. □ Yes □ No  Liver trouble such as cirrhosis
138. □ Yes □ No  Other ______________________________________

SOCIDEMOGRAPHICS

139. What year were you born? __________________________

140. Are you male or female?
    □ Male
    □ Female

141. Please pick the choice that best describes your level of education.
    □ Did not finish high school
    □ Graduated high school
    □ Some college
    □ College graduate
    □ Professional or graduate school completed

142. Are you Hispanic
140.

143. What is your race? Among the following choices, please indicate all that apply.
- White
- Black
- Asian American
- American Indian/Native Alaskan
- Native Hawaiian/Pacific Islander
- Other. Please indicate ________________________________

144. How do you pay for your medical care? Among the following choices, please indicate all that apply.
- Medicare
- Private health insurance
- Veterans Administration (VA) benefits or TRICARE
- Medicaid
- Other. Please indicate ________________________________
- No health insurance

SOCIDEMOGRAPHICS (continued)

145. Please pick the choice that best describes your current household income level before taxes.
- Less than $20,000
- $20,000 - $39,000
- $40,000 - $59,000
- $60,000 - $79,000
- $80,000 or more

146. Are you married?
- Yes
- No

147. How many family members can you count on to help you in times of need?

________________________________________________________________________________________
[If participant give range, ask him/her to give their best guess on a single number]

148. How many friends can you count on to help you in times of need?

_____________________________________

PARTICIPANT CONTACT INFORMATION

This contact information will only be used to get in touch with you for the follow-up telephone survey in 12 months. It will not be shared with anyone outside of the research staff working on this study at UAB.

Participant Information

Name ____________________________________________
Telephone number (_____)________________________
Street Address (including apartment number) ________________
City ___________________________
State ___________________________
Zip Code ___________________________

PROXY CONTACT INFORMATION

As you know, we may be contacting you by phone in approximately 12 months to ask you a few questions about whether you have needed to go into the hospital for heart failure or any other reason since this interview. As we discussed, this follow-up interview at 12 months will take approximately 10 minutes. We understand that over a 12-month time period, people sometimes move or change phone numbers, but we would like to make sure that we are able to get in contact with you. In case your contact information, which we collected previously, changes and we are unable to reach you 12 months from now, please give us the contact information for two people that would be able to provide us with your updated contact information. We will only contact the other persons if we are unable to reach you in 12 months. Otherwise, they will not be contacted by our research staff. Whether or not we need to contact the two persons that you list, their contact information will not be shared with anyone outside of the research staff working on this study at UAB. Please be sure to tell your proxy contacts that you have provided us with their contact information and that we may be contacting them in case we are unable to reach you for one of our follow-up calls.

Proxy #1
Name (Relationship) ______________________________________
Telephone number (_____)_________________________
Street Address (including apartment number) ________________
City ___________________________
State ___________________________
Zip Code ___________________________
Proxy #2
Name (Relationship) __________________________ (____________________________)
Telephone number (_____) ______________________
Street Address (including apartment number) ________________________________
City ________________________________
State ________________________________
Zip Code ________________________________
APPENDIX B

FORM 4: IRB APPROVAL FORM
Form 4: IRB Approval Form
Identification and Certification of Research
Projects Involving Human Subjects

UAB's Institutional Review Boards for Human Use (IRBs) have an approved Federalwide Assurance with the Office for Human Research Protections (OHRP). The Assurance number is FWA00005960 and it expires on January 24, 2017. The UAB IRBs are also in compliance with 21 CFR Parts 50 and 56.

Principal Investigator: KNIGHT, BERN'NADETTE
Co-Investigator(s):
Protocol Number: X111028005
Protocol Title: The Impact of Weight Status on the Adoption of Self-Care Behaviors Among Heart Failure Patients

The IRB reviewed and approved the above named project on 2-19-13. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services. This Project will be subject to Annual continuing review as provided in that Assurance.

This project received EXPEDITED review.

IRB Approval Date: 2-19-13
Date IRB Approval Issued: 2-19-13

Marilyn Doss, M.A.
Vice Chair of the Institutional Review Board for Human Use (IRB)

Investigators please note:

The IRB approved consent form used in the study must contain the IRB approval date and expiration date.

IRB approval is given for one year unless otherwise noted. For projects subject to annual review research activities may not continue past the one year anniversary of the IRB approval date.

Any modifications in the study methodology, protocol and/or consent form must be submitted for review and approval to the IRB prior to implementation.

Adverse Events and/or unanticipated risks to subjects or others at UAB or other participating institutions must be reported promptly to the IRB.