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SELF-CARE CONFIDENCE PREDICTS LESS DEPRESSION IN HEART FAILURE (85 PP.)

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Depression is prevalent in patients with heart failure (HF) and is associated with poor outcomes. Poor and/or worsening health is a predictor of depression in HF. Self-care behavior is important for the prevention of worsening health and therefore might protect against depression. Given the potential impact of self-care confidence on effective self-care behavior, it was hypothesized that self-care confidence would be inversely related to depression. Further, because self-care confidence involves belief in one's ability to manage symptoms, it was hypothesized that self-care confidence would moderate the relationship between symptom burden and depression in HF. Specifically, it was expected that symptom burden would be less strongly associated with depression among patients with greater self-care confidence. It was further hypothesized that greater HF knowledge, as well as accurate personal beliefs about HF, would be associated with greater self-care confidence. Data were obtained from the Heart ABC study. Participants were 324 individuals diagnosed with HF, recruited from cardiology departments. Measures included the Patient Health Questionnaire–9, the Kansas City Cardiomyopathy Questionnaire, the Self-care in Heart Failure Index, the Dutch Heart Failure Knowledge Scale, and the Survey of Illness Beliefs in Heart Failure. Greater self-care confidence predicted less depression ($p = .009$) and lower functioning due to higher HF symptom burden predicted greater depression ($p < .001$). However, a moderation analysis did not find an interaction effect ($p = .250$). A trend was found for a positive relationship between HF knowledge and self-care confidence ($p = .08$).

The accuracy of HF beliefs did not predict self-care confidence (p = .199). Findings of the present study suggest that HF symptom burden is positively associated with depression, whereas self-care confidence appears to be inversely associated with depression in HF. Further research is needed to explore potential mechanisms for the influence of self-care confidence on depression as well as predictors and mechanisms of increasing self-care confidence. It could be clinically beneficial for healthcare professionals to monitor for self-care confidence in those with a diagnosis of HF and to provide self-care education where needed.

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Self-Care Confidence Predicts Less Depression in Heart Failure

Cardiovascular diseases, which affect the heart and blood vessels, represent one of the largest burdens on public health today. The prevalence of cardiovascular ailments, including coronary heart disease, stroke, and high blood pressure, among others, might be as high as 48% according to the American Heart Association (Benjamin et al., 2019). Furthermore, cardiovascular diseases are a leading cause of mortality worldwide (Mendis, Puska, & Norrving, 2011). In 2017, 17.8 million deaths globally were attributed to cardiovascular diseases (Roth et al., 2017).

Heart Failure

One common cardiovascular disease diagnosis is heart failure (HF), which is the inability of the heart to pump sufficiently and maintain enough blood flow to meet the body's needs (Mant et al., 2010). There are two types of HF. Systolic HF occurs when the heart's left ventricle has an impairment in its ability to contract and pump blood through the aorta to the rest of the body. Diastolic HF occurs when the heart muscle has an impairment in its ability to relax and fill with blood to pump (2010). Traditional risk factors for HF include coronary heart disease, heart attack, high blood pressure, diabetes, obesity, and smoking, among others; and prevention behaviors should include physical activity, proper diet, and smoking cessation (Benjamin et al., 2019).

HF is a prevalent, harmful, and costly condition. Based on data from NHANES surveys (2013 – 2016), it was estimated that 6.2 million Americans had HF, and the prevalence of HF is projected to increase by 46% from 2012 to 2030 (Benjamin et al., 2019). The projected increase

in prevalence is partially due to better survival rates following heart attacks, as heart attacks contribute to the development of HF (2019). The lifetime risk for developing HF is currently estimated to be between 20% and 45% for people aged 45 years through 95 years (2019). HF was determined to be the cause of death for over 78,000 Americans in 2016, and the total US costs attributable to HF in 2012 were estimated to be $30.7 billion (2019). It has also been projected that by 2030 the total cost will have increased by 127%, to $69.8 billion, which amounts to approximately $244 for every adult in the United States (2019).

Individuals with HF often experience multiple symptoms. These include shortness of breath with physical exertion, shortness of breath while lying down, fatigue, low energy, a frequent need to rest, peripheral edema or leg swelling, and sleep difficulties (Park, Moser, Griffith, Harring, & Johantgen, 2019). These symptoms more often occur simultaneously than they do in isolation (2019). One study examined the frequency of symptoms that were reported among over 4500 hospitalized patients (mean age = 76 years) with acute HF across 11 medical centers in a New England metropolitan area (Goldberg et al., 2010). Among the participants, 93% reported shortness of breath during physical exertion, 70% reported peripheral edema, 51% reported having a cough, 37% reported shortness of breath when lying flat, and 30% reported chest pain and/or discomfort. It was also found that patients who reported fewer cardiac symptoms would receive effective cardiac treatments less often during their hospitalization than patients who reported several cardiac symptoms. Patients who reported fewer cardiac symptoms also experienced higher subsequent hospitalization rates and 30-day mortality rates ($p < .05$).

Proper evidence-based treatment has improved the long-term survival rates of patients with HF (Alpert, Smith, Hummel, & Hummel, 2017). Unfortunately, more long-term survival also brings the unintended consequence of greater symptom burden exposure over time (2017).

Further, patients may experience additional symptoms, such as gastrointestinal distress, pain, and depression (2017). If these additional symptoms are left untreated, there could be an increase in adverse clinical outcomes such as additional visits to the emergency room and/or hospitalizations, not to mention a negative impact on patients' quality of life (2017).

Treatment of HF depends on the severity and cause of the individual patient's condition. Lifestyle habit modifications are always recommended, such as proper diet, smoking cessation, and an appropriate level of physical activity suited to the individual (Mant et al., 2010). Pharmacological interventions are quite common. According to the American College of Cardiology and American Heart Association Task Force on Clinical Practice Guidelines, randomized controlled trials (RCTs) have demonstrated that Angiotensin-converting enzyme (ACE) inhibitors provide benefit for patients with mild, moderate, or severe HF, and angiotensin receptor blockers (ARBs) reduce morbidity and mortality, especially in patients who do not tolerate ACE inhibitors well (Yancy et al., 2016). Treatment also tends to be focused on symptom assessment and alleviation (Alpert et al., 2017). It has been suggested that the most successful treatments address the physical, psychological, and social difficulties that individuals with HF experience (2017). This often requires collaboration between cardiology providers, palliative medicine specialists, patients, and patient families for the best possible outcomes (2017).

Patients living with HF share some responsibility for their care. Regular monitoring of symptoms is important for early recognition and treatment of HF exacerbations, and to reduce subsequent hospitalizations (Gallagher, 2010). One study examined symptom monitoring and self-management among a community sample of people with HF (N = 63, mean age = 78 years). It was observed that daily monitoring occurred in 69.8% of the sample for peripheral edema,

65% for weight change, 41.3% for fatigue, 38.9% for shortness of breath during physical exertion, and 28.6% for shortness of breath during rest. It was also found that patients with more comorbid conditions tended to have better self-management.

In addition to monitoring and managing symptoms, there are several important self-care maintenance behaviors for individuals with HF including medication adherence, engaging in an appropriate level of physical activity, monitoring weight, and potentially reducing salt intake. A study that examined the health records of over 55,000 individuals with HF found that greater medication adherence was associated with fewer emergency room visits, fewer hospitalizations, shorter lengths of stay in the hospital, and lower all-cause mortality risk (Hood et al., 2018). A systematic review and meta-analysis of 44 RCTs demonstrated that exercise-based cardiac rehabilitation reduces rates of all-cause hospitalizations and HF-specific hospitalizations, as well as increase self-reported quality of life among individuals with HF (Taylor et al., 2019). At least one study has suggested that adherence to weight monitoring is associated with fewer HF-related emergency room visits or hospitalizations (Jones et al., 2012). Lastly, a 2018 systematic review revealed that whereas some studies have suggested a benefit for reduced salt intake, others have failed to find a significant benefit (Mahtani et al., 2018). Higher quality evidence might be necessary to determine whether limited salt intake reduces morbidity and mortality among those diagnosed with HF.

Given that self-care behavior is crucial for improving HF prognosis, it is critical to be aware of potential barriers to self-care. One study examined independent predictors of self-care maintenance, self-care management, and self-care confidence (Cameron et al., 2010). Greater self-care maintenance was predicted by having more than two months of experience with a congestive HF diagnosis. Greater self-care management was predicted by a higher New York

Heart Association (NYHA) classification, where a higher classification indicates greater functional impairment due to HF, and by having more comorbidities. Poorer self-care management was predicted by cognitive impairment, and poorer self-care confidence was predicted by advanced age and by depressive symptoms.

Depression

Individuals who suffer from clinical depression often report multiple symptoms such as a loss of pleasure or interest in activities that were previously enjoyed, or a low, sad, or irritable mood, which interferes with the individual's ability to function in daily life (American Psychiatric Association, 2013). Other symptoms could include sleep disturbance or irregular sleep patterns, loss of energy or feelings of fatigue, appetite abnormality or weight change, feelings of guilt or worthlessness, difficulties with concentration or indecisiveness, moving or speaking very slowly or "sluggishly" or feeling restless, and suicidal ideation (Abraham & Shirley, 2006). Unfortunately, symptoms of depression are relatively prevalent. Major Depressive Disorder (MDD) impacted approximately 216 million people globally in 2015 (Vos, et al., 2016). Furthermore, depression is one of the leading causes of disability in the world (Friedrich, 2017).

Depression is highly prevalent in HF. It may be up to five times more common among people living with HF than in the general population (Wallenborn & Angermann, 2013). Empirical estimates of the prevalence have varied. A 2011 study observed the prevalence of depression among 103 individuals with HF and found that 67% of the sample reported some level of depression (Pena et al., 2011). Of the 103 participants, 34% reported mild depressive symptoms, 21.3% reported moderate symptoms, and 11.6% reported severe symptoms. Another study from 2005 collected data from 200 individuals with HF and found that 52.5% reported

little if any depression, whereas 31% reported mild depression, 15% reported moderate depression, and 1.5% reported severe depression (Westlake, Dracup, Fonarow, & Hamilton, 2005). The estimated prevalence might vary by the means of depression assessment, as a meta-analysis of 36 studies found that prevalence that was estimated by use of questionnaires was approximately 33.6% whereas prevalence estimated by use of diagnostic interviews was 19.3% (Rutledge, Reis, Linke, Greenberg, & Mills, 2006). The same meta-analysis suggested that depression is more prevalent among patients with more severe HF than those with less severe HF.

In addition to being highly prevalent, depression is associated with poorer outcomes in HF. A meta-analysis of 18 studies demonstrated a relationship between depression and increased all-cause mortality (Gathright, Goldstein, Josephson, & Hughes, 2017). Additionally, an earlier meta-analysis of 36 studies found that depression in HF was associated with more health care utilization, more emergency room visits, and higher rates of hospitalization (Rutledge et al., 2006). Another study revealed an inverse relationship between depression in HF and cardiac event-free survival, as well as demonstrated that having less depression mediated a positive relationship between health-related quality of life and cardiac event-free survival (Lee, Lennie, Wu, Biddle, & Moser, 2014). Depression in HF is also associated with increased expenditures, as one study, examining over 1000 people living with HF, has shown that healthcare costs were between 26% and 29% higher for those that have been prescribed antidepressants than for those who do not exhibit symptoms of depression (Sullivan, Simon, Spertus, & Russo, 2002).

Treatment and prevention of depression in HF are crucial. There have been many studies exploring the potential benefits of antidepressants, cognitive behavioral therapy, and exercise therapy. A meta-analysis of 16 studies, comprising over 3200 patients, demonstrated that

exercise training is associated with significant reductions in depressive symptoms in the overall sample, in patients over 65 years of age, and in patients with low left ventricle ejection fraction (LVEF; Tu et al., 2014). Both long-duration and short-duration training programs were effective (2014). Another meta-analysis found that that cognitive behavioral therapy (CBT) for those with HF was associated with greater improvements in depressive symptoms than usual care, both immediately after the CBT sessions concluded and at a three-month follow-up (Jeyanantham, Kotecha, Thanki, Dekker, & Lane, 2017). Finally, a 2019 meta-analysis of 21 RCTs, comprising over 4500 individuals with HF found that exercise therapy and CBT were both associated with larger reductions in depressive symptoms than usual care (Das et al., 2019). However, antidepressant medication was not effective for depression in HF. One well-known example was the SADHART-CHF (Sertraline Against Depression and Heart Disease in Chronic Heart Failure) trial (O'Connor et al., 2010). The trail was a double-blind RCT comparing the efficacy of Sertraline against a placebo for depression in HF. Participants (N = 469) were randomly assigned to one of the two groups. Sertraline did not provide a significantly greater reduction in depression symptoms relative to the placebo. The 2019 meta-analysis also called for RCTs that could compare the relative effectiveness of exercise, CBT, and antidepressants for reducing depression in HF (Das et al., 2019).

Current treatment approaches for depression in HF have limitations. The efficacy of antidepressants in HF is not well established, the difficulty of exercise for individuals simultaneously experiencing depression and HF may result in poor adherence, and CBT might not always be readily available. Thus, prevention strategies may be a key part of depression management in HF. Effective prevention of depression in HF would be aided by knowledge of which variables might predispose those with HF to be more vulnerable to developing depression.

Depression may predict poor health outcomes and poor health may contribute towards depression. One study investigated anhedonia in mice by observing their preference for sugar after some mice experienced surgically induced HF via coronary artery ligation and subsequent heart attack and some mice experienced a sham surgery (Frey et al., 2014). Relative to the healthier mice, the mice with induced HF showed a reduced preference for sugar six weeks after a heart attack, suggesting anhedonia. A study featuring 131 human participants, who were hospitalized for HF without any significant depression, observed that 22.1% developed significant depression symptoms within one year following discharge (Shimizu, Suzuki, Okumura, & Yamada, 2014). The study also observed that previous ischemic heart disease, limitations in social interaction and activity, and a lack of satisfaction with social support each predicted development of depression. Depression in HF has also been predicted by poorer perceived health-related quality of life, shortness of breath, and having a greater symptom burden (Kao et al., 2014; Seo, Yates, Dizona, LaFramboise, & Norman, 2014; Graven, Martorella, Gordon, Grant Keltner, & Higgins, 2017). Other demonstrated physical health predictors of depression include NYHA classification of HF (Altay et al., 2012; Lossnitzer et al., 2013; Zahid et al., 2018) and lower LVEF (Altay et al., 2012, Kao et al., 2014). Social variables are important predictors as well. Cognitive and affective symptoms of depression have been predicted by greater loneliness, and somatic symptoms of depression have been predicted by having less friend support (Seo, et al., 2014). Being unmarried and having less "belonging" social support have also been associated with a greater risk of developing depression (Zahid et al., 2018; Graven et al., 2017).

Protective factors might be derived from known predictors of depression in HF. Poor health, indicated by a larger symptom burden, higher NYHA classification, and lower LVEF, has

been associated with greater risk for developing depression (Altay et al., 2012; Lossnitzer et al., 2013; Kao et al., 2014; Seo et al., 2014; Graven et al., 2017; Zahid et al., 2018). Therefore, preserving health is imperative. It has been shown that self-care behaviors such as self-monitoring and management of symptoms (Gallagher, 2010), medication adherence (Hood et al., 2018), an appropriate level of physical activity (Taylor et al., 2019), and monitoring weight (Jones et al., 2012) have been associated with fewer emergency room visits, fewer hospitalizations, shorter lengths of stay in the hospital, and lower all-cause mortality risk. Because optimal self-care behavior prevents worsening health, it might also protect against depression by extension. Further, because cognitive impairment predicts poorer self-care (Cameron et al., 2010), monitoring of cognitive function should also be important. Besides worsening health, poorer social support has also been shown to increase the risk of developing depression in HF (Seo, et al., 2014; Graven et al., 2017; Zahid et al., 2018). Thus, accumulating more social support and exploring how social support reduces the risk of depression could also be beneficial. Variables that improve self-care behavior and expand upon the protection that social support provides would be crucial for preventing depression.

Self-Care Confidence in Heart Failure

Self-efficacy has been described as a personal judgment of confidence in the ability to perform a particular task (Bandura, 1986); and self-care confidence in HF is a form of task-specific self-efficacy. That is, self-care confidence is confidence in the ability to perform tasks that are relevant to maintaining physiological stability (self-care maintenance) and responding to HF symptoms when they occur (self-care management; Riegel, Lee, Dickson, & Carlson, 2009). Thus, self-care confidence could have a direct impact on the processes of self-care behavior (maintenance and management) and therefore be crucial for health outcomes (Chuang, Kao, Lin,

& Chang, 2019). Because poor health is associated with depression risk, self-care confidence might be an additional protective factor against depression.

Because cognitive impairment predicts poorer self-care behavior (Cameron et al., 2010), models have been tested to observe the roles of both cognitive impairment and self-care confidence in self-care behavior (Vellone, Pancani, Greco, Steca, & Riegel, 2016). Participants consisted of 280 patients with HF from three out-patient sites in the eastern United States. Data regarding HF self-care and self-care confidence were collected via the Self-Care of Heart Failure Index (SCHFI; Riegel et al., 2009). Cognitive performance was measured by administering a battery of neuropsychological assessments. Cognitive variables included working memory, short-term memory, processing speed, and simple and complex attention. Medical records were also examined to extract clinical data. The cognitive variables of simple attention, working memory, and short-term memory were related to self-care behavior. Self-care confidence was demonstrated to mediate the relationships between simple attention and working memory with self-care. Thus, self-care confidence seems to be an important variable even when cognition is impaired. Interventions that improve self-care confidence could be especially important for impacting self-care behavior, health outcomes, and depression.

It is also known that lack of social support is a known risk factor for depression in HF (Zahid et al., 2018). This may be due to loneliness or a lack of "belonging" (Seo, et al., 2014; Graven et al., 2017). An additional explanation might be that having social support improves self-care and health outcomes, which in turn has an impact on depression. An observational study of 280 individuals with HF examined the role of social support for self-care (Fivecoat, Sayers, & Riegel, 2018). Three types of social support were examined: emotional support, instrumental support, and assistance with self-care. Data regarding self-care confidence,

maintenance, and management were collected at baselines and follow-ups at three months and six months later. It was found that emotional support and instrumental support predicted better self-care confidence. Further, emotional support was associated with better self-care management, and assistance with self-care was associated with better self-care maintenance. Moreover, some studies have tested mediation models, in which self-care confidence mediates a relationship between social support and self-care behavior. A survey study of 150 people with HF collected data regarding self-care via the SCHFI, and social support was measured with the Medical Outcomes Study social support survey (Cené et al., 2013). Regression analyses revealed that greater informational support and emotional support were associated with better self-care maintenance. Further, self-care confidence was found to mediate the relationship between perceived support and self-care maintenance. Another study of 157 hospitalized patients with HF examined the relationship between social support and treatment adherence (Hammash et al., 2017). Social support was a significant predictor of treatment adherence. However, when self-care confidence was added to the model as a mediator, the effect of social support became non-significant. This collection of studies demonstrates that social support is important for self-care behavior and that self-care confidence mediates this relationship. This further suggests the importance of self-care confidence for health outcomes and depression.

Self-care confidence might be key for improving self-care behavior and subsequent health outcomes, as well as for reducing the risk of depression in HF. Therefore, interventions that improve self-care confidence would be valuable. Such interventions could incorporate positive predictors of self-care confidence. Education programs have improved self-care and health outcomes, and one suggested mechanism is via expanding HF knowledge (van der Wal, Jaarsma, Moser, & van Veldhuisen, 2005). Perhaps having more knowledge enhances self-care

confidence, which in turn increases self-care behavior. Another potentially important variable is that of HF beliefs. Inaccurate beliefs regarding the chronic nature of HF, its consequences, and ways that it can be controlled could impact self-care behavior adherence (Albert & Zeller, 2007). Perhaps if patients hold the belief that although HF is a serious chronic condition, proper self-care can limit negative consequences, then self-care confidence may be improved.

Heart Failure Knowledge

As previously mentioned, one potential enhancer of self-care confidence could be HF knowledge. Following an appropriate treatment regimen requires some level of HF knowledge and health literacy, which is the ability to attain and process health information and make healthy decisions (Hawkins et al., 2016). One study examined the prevalence of adequate literacy among a sample of 95 individuals with HF, as well as how literacy related to knowledge, self-care, and health outcomes (Dennison et al., 2011). Health literacy was adequate for 39% of the sample, marginal for 19%, and inadequate for 42%. Individuals with greater literacy tended to have higher educational attainment. Those with inadequate literacy had significantly less HF knowledge than those with adequate or marginal literacy. Adequate literacy was also associated with greater self-care confidence. Another study examined relationships between both health literacy and cognitive function with HF knowledge among 330 individuals with HF (Hawkins et al., 2016). Cognitive function was assessed with a Mini-Mental Status Examination (Teng & Chui, 1987) and HF knowledge was measured with the Dutch Heart Failure Knowledge Scale (van der Wal, et al., 2005). Cognitive function and health literacy were both positively associated with HF knowledge (Hawkins et al., 2016).

Some studies have tested education programs for self-care in HF and observed their effects on HF knowledge and self-care confidence, maintenance, and management. One study

allocated 131 individuals with HF either to a self-care education program or a usual care control group (Liou et al., 2015). HF knowledge was tested in both groups before and after the intervention. Data regarding self-care and NYHA class were also collected. Relative to the control group, those receiving the education program showed significantly higher scores for HF knowledge following the intervention. Self-care confidence, maintenance, and management all improved following completion of the program. Also, those in the intervention group improved their NYHA classification relative to those in the control group.

These results appear to be replicable internationally, as similar studies have been conducted in Thailand, Jordan, and Vietnam. One such study tested a family-based education program for people with HF and their caregivers in Thailand (Srisuk, Cameron, Ski, & Thompson, 2017). Participants were 100 patient-caregiver dyads, recruited from cardiac clinics in southern Thailand, which were evenly allocated to either a "usual care" group or a family-based education program. The program consisted of in-person counseling, a "heart failure manual" and DVD, and support via telephone calls. Data regarding HF knowledge, self-care confidence, maintenance, management, and health-related quality of life were collected at baseline and three-month and six-month follow-ups. Compared to those who received usual care, those who completed the education program had higher HF knowledge scores, better self-care confidence and maintenance, and better health-related quality of life scores at three and six months, as well as better self-care management scores at six months. A similar study tested a cardiac education program in Jordan (Tawalbeh, 2018). A total of 127 patients with HF were randomly assigned to either the education group or a control group. HF knowledge, self-care confidence, and self-care behaviors were assessed at one and three months following the completion of the program. For those receiving the education program, HF knowledge scores,

self-care confidence, and self-care behavior increased significantly from pretest to both posttests and compared to those in the control group.

Finally, a study evaluated a self-care education program that involved the patients teaching back the provided information to a nurse to ensure understanding (Dinh, Bonner, Ramsbotham, & Clark, 2019). Participants with HF (N = 140) were randomly assigned to either receive usual care and an HF booklet or to receive usual care plus the teach-back HF self-care education program. The program involved an individual education session, which involved checking for comprehension by having the patient teach the information back; and by providing an HF booklet, weighing scales, a diary, and a phone call to follow up two weeks after discharge. HF knowledge, self-care confidence, and self-care behavior were assessed one and three months later. Findings indicated that the education group attained significantly greater HF knowledge than the control group. However, a significant difference in self-care confidence was not found. This could suggest that while HF education and knowledge are important, other factors might play a role as well.

Beliefs about Heart Failure

Knowledge about one's illness is important for self-care, which impacts health outcomes and potentially depression, though other factors might also impact self-care confidence. For instance, personal beliefs and attitudes towards HF, its consequences, and its management might make an impression on self-care confidence and behavior as well as on subsequent outcomes including depression. Further, as the status of patients' health changes, beliefs regarding their illness might be impacted. Beliefs were investigated in a sample of 166 patients that were recently diagnosed with HF (Mulligan et al., 2012). The researchers observed how the patients' beliefs changed over the first six months following their diagnosis. From baseline to six months,

patients' emotional concerns about treatment had lessened, belief in the long-term nature of HF had strengthened, and belief in the amenability of HF to cure or control had weakened. Thus, it might be helpful for those with HF to be mindful of their illness beliefs over time and for health professionals to monitor changes.

Illness beliefs appear to be related to patients' self-care. One study examined illness beliefs and self-care in a sample of 88 patients with HF during admission to a hospital and at two months and six months following their discharge (Goodman, Firouzi, Banya, Lau-Walker, & Cowie, 2013). Findings revealed the HF symptoms alleviated over time and self-care maintenance improved. Patients within the sample commonly believed that the causes of their HF were beyond their control, even after six months. Negative emotional responses (e.g., fear, anger, and distress) to illness were associated with poorer self-care confidence whereas having more illness coherence (i.e., understanding and making sense of HF) was associated with greater self-care confidence. A similar study that distributed surveys to 169 individuals with HF found that correlates of better self-care behavior included better illness coherence, belief that medication is necessary, and greater medication knowledge (MacInnes, 2013). Further, significant predictors of self-care behavior included the belief that HF has serious consequences, adequate knowledge regarding medication use, and the perception that medication use does not cause a major disruption to one's lifestyle.

In addition to self-care in the short term, beliefs about HF might have consequences for future health outcomes and depression. One study investigated associations between illness beliefs, medication adherence, and hospital readmissions (Turrise, 2016). Participants were 96 patients with HF who were recently discharged from a hospital. Analyses revealed that medication adherence could be predicted by the belief that the necessity of taking medication

outweighed personal concerns about taking medication. Similarly, hospital readmission within 30 days was associated with the belief that patients' treatment is not effective at controlling HF. These findings advocate for health practitioners to identify who might be at greater risk of nonadherence or of hospital readmission, and to address patients' concerns about medications and treatment. Another study explored whether certain beliefs may be directly associated with depression (Albert & Zeller, 2009). In a sample of 219 elderly individuals with HF, 47% exhibited depression. It was revealed that having empirically accurate beliefs about HF was associated with more depression and that this was due to the influence of believing in the seriousness of the consequences of having HF. However, beliefs regarding how to control HF were unchanged across levels of depression. This could suggest that those who perceive the seriousness of HF without necessarily having more confidence in controlling HF are more likely to be depressed.

The Present Study

The present study sought to examine self-care confidence as a protective factor against depression as well as investigate potential predictors of self-care confidence. Thus, the study involves examining modifiable variables that could have an impact on HF self-care and prevent depression. Depression in HF is prevalent and associated with poor health outcomes (Rutledge et al., 2006). Poor and/or worsening health is a predictor of depression in HF (Altay et al., 2012; Lossnitzer et al., 2013; Kao et al., 2014; Seo et al., 2014; Graven et al., 2017; Zahid et al., 2018). Self-care behavior is important for preservation of health and therefore might protect against depression. Having more social support also appears to be associated with less depression (Seo, et al., 2014; Graven et al., 2017; Zahid et al., 2018). Self-care confidence could have a direct impact on the processes of self-care behavior (Chuang, Kao, Lin, & Chang, 2019), and self-care

confidence also mediates the relationship between social support and self-care behavior (Cené et al., 2013; Hammash et al., 2017). Therefore, it was hypothesized that self-care confidence would be inversely related to depression such that higher scores on a measure of self-care confidence would predict lower scores on a measure of depression (Hypothesis 1). As it previously has been demonstrated, it was also hypothesized that greater symptom burden would be associated with higher scores on an assessment of depression (Hypothesis 2). Further, because self-care confidence involves belief in one's ability to maintain stability and manage symptoms, it was hypothesized that self-care confidence would moderate the relationship between symptom burden and depression such that symptom burden's association with depression weakens at higher levels of self-care confidence (Hypothesis 3).

Because self-care confidence could be key for protecting against depression, positive predictors of self-care confidence could be incorporated into interventions. Confidence may arise from experience and knowledge, and it has been shown that HF education programs enhance both HF knowledge and self-care confidence (Liou et al., 2015; Srisuk et al., 2017; Tawalbeh, 2018). Perhaps one mechanism by which these programs improve self-care confidence is by increasing HF knowledge. Therefore, it was hypothesized that greater HF knowledge would be predictive of greater self-care confidence (Hypothesis 4). Personal beliefs and attitudes regarding the seriousness of HF and the ability of patients to influence their health through their behavior could have an impact on self-care confidence, and some preliminary studies have investigated the role of beliefs for self-care behavior (e.g., Goodman et al., 2013; MacInnes, 2013; Turrise, 2016). Therefore, it was hypothesized that accurate beliefs about HF and its management would predict greater self-care confidence (Hypothesis 5). A conceptual model of the hypotheses is presented in *Figure 1*.

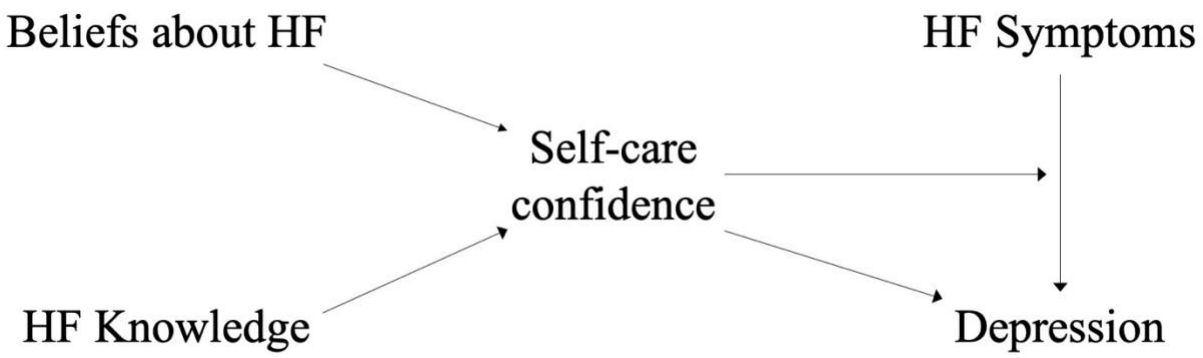

Figure 1. Conceptual model of the study

Hypotheses

The objectives of the proposed study are to evaluate whether self-care confidence moderates a relationship between HF symptoms and depression, and whether HF knowledge and beliefs about HF predict self-care confidence. The following specific hypotheses will be tested:

1. Self-care confidence will be negatively associated with depression, such that patients that report greater self-care confidence will report lower levels of depression.
2. HF symptoms will be positively associated with depression, such that patients that report more frequent and bothersome symptoms will also report greater levels of depression.
3. Self-care confidence will moderate a relationship between HF symptoms and depression, such that HF symptoms will have a weaker association with depression when patients report higher levels of self-care confidence.
4. HF knowledge will be positively associated with self-care confidence, such that patients with greater HF knowledge will also report having greater self-care confidence.

5. Patient beliefs about HF will be associated with self-care confidence, such that patients that maintain more accurate beliefs about HF (e.g., “HF can get worse by my lifestyle behaviors and actions”) will have greater self-care confidence.

Methods

Participants

Participants consisted of 324 adults with a diagnosis of HF. Participants were recruited from inpatient and outpatient cardiology departments at Summa Health System's Akron City Hospital in Akron, Ohio, and University Hospitals in Cleveland, Ohio from August 2010 through October 2013. Potential participants were considered eligible for inclusion in the proposed study if they were between 50 and 85 years of age and had a diagnosis of HF, as categorized by the New York Heart Association classification system. Patients were ineligible for inclusion if they had a history of a neurological disorder (e.g., dementia or Alzheimer's disease), severe brain injury, history of significant psychiatric disorders (e.g., psychotic disorders), significant substance abuse within the five years prior to enrollment, untreated sleep apnea, or renal failure requiring dialysis. Patients were also excluded if they were using any telehealth programs from their home for managing HF care. Participants provided informed consent before participating in any part of the study.

Measures

Depression symptoms. Depression symptoms were measured via the Patient Health Questionnaire–9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001). The PHQ-9 is a self-report inventory consisting of 9 items about depression symptoms, and a scale for the frequency of each item ranging from "Not at all" to "Nearly Every day." Total scores may range from 0 to 27, where higher scores indicate greater depressive symptomology. The PHQ–9 has been validated for use among a population with HF diagnoses (Hammash, et al., 2013). Internal consistency

reliability was supported (Cronbach's α = .83). A comparison between the PHQ-9 and the Beck Depression Inventory (BDI-II) supported concurrent validity, and construct validity was also established. A cut-off score of 10 for significant depression symptoms was 70% sensitive and 92% specific. Cronbach's alpha for the PHQ-9 in the present sample was .872.

Heart failure symptoms. HF symptoms were assessed via the Kansas City Cardiomyopathy Questionnaire (KCCQ), a 23-item self-report measure for individuals with congestive HF that quantifies symptoms, physical limitations, social interference, self-efficacy, and quality of life (Green, Porter, Bresnahan, & Spertus, 2000). Scores are scaled from 0 (lowest level of functioning) to 100 (highest level of functioning). Cronbach's alpha for the "Symptoms" domain was originally .88 and criterion validity was established by comparing the KCCQ's Symptoms domain scores across patients who were categorized by the New York Heart Association (NYHA) classification of HF severity, where higher classifications indicate greater severity of HF. An analysis of variance revealed that KCCQ symptom scores progressively worsened at higher NYHA classifications. Because past studies have shown that NYHA classification has predicted depression in HF (Altay et al., 2012; Lossnitzer et al., 2013; Zahid et al., 2018), the classification was included as a covariate in the present study's analysis to test the hypothesis that symptom burden predicts depression. Additionally, the inclusion of NYHA classification in the analyses introduces a measure that is not self-report. Cronbach's alpha for the KCCQ symptoms subscale in the present sample was .859.

Self-care confidence. Self-care confidence was measured via the self-care confidence subscale of the Self-Care in HF Index (SCHFI; Riegel et al., 2009). This self-reported index assesses the decision-making process regarding behaviors that maintain health and respond to HF symptoms when they arise. Specifically, the self-care confidence subscale quantifies confidence

in one's abilities to perform these particular behaviors. Analysis of the SCHFI has shown that no learning effect has been observed from repeated administrations, and there were no statistically significant correlations between the three self-care scales and a social desirability scale. Scores for each of the scales are standardized, ranging from 0 (poorest) to 100 (greatest), and scores of 70 or greater represent "adequate" self-care. Further, a change in a scale score by one half of a standard deviation or more is considered clinically significant (2009). Confirmatory factor analysis has suggested that the index is best used as three individual scales or variables (self-care confidence, maintenance, and management) rather than a total score of self-care (Vellone et al., 2013). Psychometric testing also supported sufficient internal consistency, test-retest reliability, and contrasting-groups validity for the index (2013). The primary analyses of the present study utilized data from two administrations of the SCHFI. Cronbach's alpha for the SCHFI in the present sample was .853 or the first administration and .845 for the second administration. Participant responses to these two administrations were correlated, $r = .387$, $p < .001$.

Heart failure knowledge. The Dutch HF knowledge scale is a self-report inventory consisting of 15 multiple-choice items regarding general HF knowledge, knowledge of HF treatment and maintenance, and knowledge of HF symptoms and symptom recognition (van der Wal et al., 2005). Scores on the scale range from 0 (least knowledge) to 15 (most knowledge). Content validity for the scale was confirmed by experienced HF nurses and cardiologists. Knowledge scale scores were compared between those who have completed an HF education course and newly diagnosed patients who had not had any HF education. The education group had higher HF knowledge scores, suggesting construct validity.

Beliefs about heart failure. The Survey of Illness Beliefs in HF evaluates the accuracy of patients' beliefs about HF, as well as their relative level of certainty in their beliefs (Albert &

Zeller, 2007). Accuracy would be reflected by an understanding of HF as a progressive and chronic condition that requires consistent self-care behaviors and management even if the patient is not currently experiencing symptoms. Each item on the survey is rated on a Likert scale, consisting of four options: "strongly disagree," "disagree," "agree," and "strongly agree." To score the survey, all items should be keyed such that they reflect accurate statements and participant responses are computed such that strongly disagree has a value of "1" and strongly agree has a value of "4". A mean of all items is then taken, where a mean score of 3.0 or higher is considered to reflect adequate accuracy. Content validity of the items was verified by HF health professionals (2007). Exploratory factor analysis suggested 2 factors (accurate beliefs and inaccurate beliefs) across 14 items. Cronbach's alpha for the 14-item tool was .73 in the original sample. The survey was administered to patients with advanced HF, who were treated by physicians that specialized in HF, that were likely to have had education about and experience with HF. As expected, these patients reported accurate beliefs about HF, supporting construct validity for the survey. Cronbach's alpha for the survey in the present sample was .684.

Social support. Because social support appears to be a predictor for depression (Seo et al., 2014; Graven, et al., 2017; Zahid et al., 2018) and self-care confidence (Fivecoat et al., 2018), a measure of perceived social support was considered as a covariate in the primary analyses. The Multidimensional Scale of Perceived Social Support (MSPSS) measures the subjective level of support that one feels from family, friends, and significant others (Zimet, Dahlem, Zimet, & Farley, 1988). Mean scores range from 1 (least perceived amount of social support) to 7 (most perceived amount of social support). Zimet and colleagues found that the MSPSS has adequate internal reliability, test-retest reliability, and construct validity (Zimet et al., 1988). The MSPSS was administered twice throughout the study's procedure. Cronbach's

alpha for the MSPSS in the present sample was .943 or the first administration and .939 for the second administration. Participant responses to these two administrations were correlated, $r = .650$, $p < .001$.

Procedure

The present study utilized archival data from a larger study titled "Heart Adherence, Behavior, and Cognition study" (the Heart ABC study). The Heart ABC study was a longitudinal, observational study originally designed to examine cognitive and psychosocial variables, self-care behaviors, medication adherence, and health outcomes in older adults with systolic HF. The study protocol was approved by the institutional review boards of Kent State University, Summa Health System, Case Western Research University, and University Hospitals of Cleveland. In the Heart ABC study protocol participants were visited in their homes for a baseline visit and another three times: two, three, and six weeks after the baseline visit. Telephone call follow-ups were conducted monthly for four months following the fourth in-home visit. During the visits and follow-ups, participants provided information and completed self-report inventories. For use in the primary analyses, the SCHFI, KCCQ, and MSPSS were administered during the baseline visit. The PHQ-9 and the MSPSS were also administered during the third in-home visit, three weeks after the baseline visit. The Dutch Heart Failure Knowledge Scale was administered during the fourth visit, six weeks after the baseline visit. The Survey of Illness Beliefs in Heart Failure was administered during the second telephone interview after the fourth in-home visit. Finally, the SCHFI was administered again during the third telephone interview following the fourth in-home visit. See *Figure 2* for a timeline of the data collection.

Data collected:	-NYHA -KCCQ -SCHFI -PHQ-9 -MSPSS	-SCHFI	-SCHFI -PHQ-9 -MSPSS	-SCHFI -DHFKS	-KCCQ -SCHFI -NYHA	-KCCQ -SCHFI -NYHA -SIBHF	-KCCQ -SCHFI -NYHA	-KCCQ -SCHFI -NYHA
Time point:	Baseline (Visit 1)	Visit 2	Visit 3	Visit 4	Telephone Follow-up 1	Telephone Follow-up 2	Telephone Follow-up 3	Telephone Follow-up 4
Approximate Time after Baseline (in weeks):	0	2	3	6	10	14	18	22

Figure 2. Timeline of Data Collection

Note. NYHA = New York Heart Association Heart Failure Classification, KCCQ = Kansas City Cardiomyopathy Questionnaire, SCHFI = Self Care of Heart Failure Index, PHQ-9 = Patient Health Questionnaire, MSPSS = Multidimensional Scale of Perceived Social Support, DHFKS = Dutch Heart Failure Knowledge Scale, SIBHF = Survey of Illness Beliefs in Heart Failure.

Analytic Strategy

Preliminary Analyses. All statistical analyses were conducted with SPSS, version 26 (IBM Corporation, Armonk, NY). Data regarding the variables of interest (self-care confidence, depression, HF symptoms, HF knowledge, HF beliefs, and social support) were explored in terms of their means, standard deviations, skewness, and kurtosis. Means and standard deviations are reported in *Table 1*. Data were screened for outliers, as defined by values that are more than three standard deviations above or below the mean. Finally, bivariate correlations were tested between the outcome variables and their proposed predictors (see Primary Analyses below and Tables 2 and 3).

Primary Analyses. Hypotheses one, two, and three were tested via a moderation analysis. Moderation was tested in SPSS using the PROCESS tool, version 3, by Dr. Andrew Hayes (2019). The PROCESS tool automatically computes an interaction term, mean-centers the predictor and moderator variables in the model, and makes use of a heteroscedasticity consistent covariance matrix, HC3, which corrects well for heteroscedasticity, even with small sample sizes. Data from the KCCQ and SCHFI baseline administrations were used to predict the PHQ-9 data that were collected during the third in-home visit. Potential covariates for predicting depression, including NYHA classification, social support, marital status, sex, and age were tested for correlations before being included in the model (see *Table 2*). Hypotheses four and five were tested via a hierarchical multiple linear regression analysis. Assumptions of regression, including linearity, homoscedasticity, and normally distributed residuals were examined via scatterplot, partial plots, and a normal probability plot respectively. Data collected via the Dutch HF knowledge Scale during the fourth in-person visit and data collected via the Survey of Illness Beliefs in Heart Failure during the second telephone interview were used to predict data from the

SCHFI administration during the third telephone interview. Potential covariates of self-care confidence, including social support, marital status, depression, age, and education level were tested for correlations before being included in the model (see *Table 3*).

Power Analysis. A power analysis was conducted using G*Power, version 3.1 software. The power analysis was based on the proposed moderation analysis, as it would require more power than the hierarchical regression analysis because it features three tested predictors (HF symptoms, self-care confidence, and the interaction term between the two) rather than two tested predictors (HF knowledge and HF beliefs). Given three tested predictors, up to eight total predictors including covariates, a power of .80, an alpha of .05, and assuming a conservative small-to-medium effect size of Cohen's $f^2 = .08$, the suggested minimum sample size is 141. Given the available sample size of 324, the analyses appeared to be adequately powered.

Results

Participant Characteristics

Participants consisted of 324 adults who had been diagnosed with HF. Participants' levels of physical limitation due to HF were categorized according to the NYHA classification system, where a higher classification indicates greater impairment due to HF. Approximately 9.9% of participants were categorized as having Class 1 HF, 23.1% were categorized into Class 2, 61.8% were categorized into Class 3, and 5.1% were categorized into Class 4. The mean age of the participants was 68.7 years (SD = 9.7 years). Approximately 59.7% of participants were male and 72.0% were Caucasian. Mean levels of self-care confidence, depression, symptom burden, HF knowledge, accuracy of HF beliefs, and social support are reported in *Table 1*. Mean levels of self-care confidence in the participant sample were consistent with norms for adequate self-care as measured by the SCHFI (Riegel et al., 2009).

Table 1. Participant Characteristics

	M ± SD		
	Total	Males	Females
SCC – BL	71.91 ± 15.28	71.54 ± 14.98	72.53 ± 15.82
SCC – T3	75.42 ± 13.68	74.50 ± 14.00	76.97 ± 13.05
PHQ-9	3.91 ± 4.76	3.42 ± 4.63	4.72 ± 4.89
KCCQ_sym	76.52 ± 22.06	78.46 ± 21.79	73.27 ± 22.24
DHFKS	11.55 ± 1.86	11.36 ± 1.86	11.87 ± 1.82
SIBHF	2.90 ± .28	2.89 ± .29	2.93 ± .27
MSPSS – BL	5.72 ± 1.21	5.65 ± 1.21	5.83 ± 1.19
MSPSS – V3	5.75 ± 1.18	5.74 ± 1.13	5.77 ± 1.25

Note. SCC= self-care confidence, BL = baseline, T3 = telephone follow-up #3, PHQ-9 = Patient Health Questionnaire, MSPSS = Multidimensional Scale of Perceived Social Support, V3 = in-home visit #3, KCCQ – Sym = Kansas City Cardiomyopathy Questionnaire symptoms subscale, DHFKS = Dutch Heart Failure Knowledge Scale, SIBHF = Survey of Illness Beliefs in Heart Failure.

Preliminary Analysis Results

Data were explored before performing the primary analyses. Univariate data were screened for outliers, skewness, kurtosis, and normality. PHQ-9 scores were positively skewed (skewness = 1.873, std. error = .130) and showed some kurtosis (kurtosis = 4.139, std. error = .259). A square root transformation was performed, and the primary analyses were run once with transformed data and once with untransformed data. Bivariate correlations were tested between the primary analyses' outcome variables and their proposed predictors. Potential covariates for predicting depression, including NYHA classification, social support, marital status, sex, and age were tested before being included in a primary analysis (see *Table 2*). Because age was not correlated with depression, it was excluded as a covariate from the final analyses to preserve power. Similarly, potential covariates of self-care confidence, including social support, marital status, depression, age, and education level were tested before being included in a primary analysis (see *Table 3*). Because marital status, age, and education level were not correlated with self-care confidence, they were excluded as covariates from the final analyses to preserve power.

Table 2. Correlations of Depression and Predictors

	1	2	3	4	5	6	7	8
1. PHQ-9	-							
2. SCC - BL	-.267**	-						
3. KCCQ_sym	-.488**	.237**	-					
4. NYHA	.302**	-.204**	-.453**	-				
5. MSPSS - BL	-.210**	.167**	.187**	-.084	-			
6. Marital Status	.182**	.015	-.183**	.081	-.200**	-		
7. Sex	.147**	.015	-.119*	.165**	.065	.205**	-	
8. Age	-.103	.013	.095	-.050	.174**	-.058	-.088	-

Note. PHQ-9 = Patient Health Questionnaire, SCC = self-care confidence, BL = baseline, KCCQ_sym = Kansas City Cardiomyopathy Questionnaire – symptoms subscale, NYHA = New York Heart Association Heart Failure Classification, MSPSS = Multidimensional Scale of Perceived Social Support.

N = 324

*p < .05

** p < .01

Table 3. Correlations of Self-care Confidence and Predictors

	1	2	3	4	5	6	7	8
1. SCC - T3	-							
2. DHFKS	.118*	-						
3. SIBHF	.081	.185**	-					
4. MSPSS - V3	.292**	.013	.002	-				
5. Marital Status	.068	.067	.030	-.165**	-			
6. PHQ-9	-.174**	-.047	.083	-.292**	.219**	-		
7. Age	-.005	-.075	-.107	.087	-.065	-.095	-	
8. Education	.070	.231**	.172**	.108	-.003	-.177**	.098	-

Note. SCC = self-care confidence, T3 = telephone follow-up #3, DHFKS = Dutch Heart Failure Knowledge Scale, SIBHF = Survey of Illness Beliefs in Heart Failure, MSPSS = Multidimensional Scale of Perceived Social Support, V3 = in-home visit #3, PHQ-9 = Patient Health Questionnaire.

N = 312

*p < .05

** p < .01

Primary Analysis Results

Hypotheses one, two, and three were tested with moderation analyses. The model consisted of covariates, HF symptom burden, HF self-care confidence, and an interaction term predicting depression in HF. The results of the analyses that utilized transformed or untransformed depression data did not differ. Therefore, the results that utilized untransformed data are reported here for ease of interpretation. The overall model was found to account for approximately 30% of the variance in depression $R^2 = .300$, $F(7, 316) = 12.248$, $p < .001$ (see *Table 4*), and a large effect size was observed, Cohen's $f^2 = .429$. Greater self-care confidence was found to predict less depression in HF, $B = -.049$, $p = .009$, and lower functioning due to higher symptom burden was found to predict greater depression in HF, $B = -.081$, $p < .001$. However, the interaction term between symptom burden and self-care confidence was not statistically significant, $B = .001$, $SE = .001$, $t = 1.153$, $p = .250$, $\Delta R^2 = .007$. Simple slopes analyses revealed that symptom burden maintained a statistically significant relationship with depression at low, mean, and high (one stand deviation above the mean) levels of self-care confidence. Symptom burden appeared not to be significantly associated with depression only when self-care confidence was 23 points above the mean or higher.

Table 4. Moderation Analysis

Predictor	*B*	*SE B*	*t*	*p*
NYHA	.504	.326	1.547	.123
MSPSS	-.366	.251	-1.458	.146
Marital Status	.281	.246	1.143	.254
Sex	.859	.537	1.599	.111
KCCQ_sym	-.081	.015	-5.457	< .001
SCC	-.049	.018	-2.647	.009
KCCQ_sym X SCC	.001	.001	1.153	.250

Note. R^2 = .300, $F(7, 316) = 12.248$, $p < .001$, Cohen's f^2 = .429. NYHA = New York Heart Association Heart Failure Classification, MSPSS = Multidimensional Scale of Perceived Social Support, KCCQ_sym = Kansas City Cardiomyopathy Questionnaire – symptoms subscale, SCC = self-care confidence.

Hypotheses four and five were tested via a hierarchical multiple linear regression analysis, with covariates, HF knowledge, and HF beliefs predicting self-care confidence. Assumptions of regression were tested. Data were screened for multivariate outliers using Cook's distance. No outliers were found, as all Cook's distance values were less than 1.0 (greatest value = .070). The assumption of independent errors was confirmed with a Durbin-Watson test, with a safe value of 1.677 (safe range: 1.0 – 3.0). The absence of perfect multicollinearity was assessed by examining correlations between variables (see *Table 3*), as well as testing the variance inflation factor (VIF) and tolerance. Because the VIF values were well below 10 (mean = 1.071) and the tolerance values were well above 0.2 (mean = .934), multicollinearity was not judged to be a concern. In the hierarchical model, covariates were entered into Step 1 and the main predictors were added in Step 2. The model in Step 2 was found to account for approximately 11% of the variance in self-care confidence $R^2 = .111$, $\Delta R^2 = .017$, $F(2, 307) = 2.907$, $p = .056$ (see *Table 5*), and a small effect size was observed, Cohen's $f^2 = .017$. A positive relationship between HF knowledge and self-care confidence was found to approach significance ($\beta = .096$, $p = .08$), but did not meet the $p = .05$ threshold. However, a modest positive correlation was found between HF knowledge and self-care confidence ($r = .118$, $p = .038$; see *Table 3*). A positive relationship between the accuracy of HF beliefs and self-care confidence was not statistically significant ($\beta = .071$, $p = .199$).

Table 5. Regression Results Predicting Self-care Confidence

Step	Predictor	*B*	*SE B*	β	*t*	*p*
Step 1	MSPSS	3.129	.671	.264	4.661	< .001
	PHQ-9	-.284	.165	-.097	-1.717	.087
Step 2	MSPSS	3.105	.668	.262	4.652	< .001
	PHQ-9	-.290	.165	-.099	-1.753	.081
	DHFKS	.707	.402	.096	1.757	.080
	SIBHF	3.323	2.581	.071	1.287	.199

Note. For Step 1: $R^2 = .094$, $F(2, 309) = 16.037$, $p < .001$, Cohen's $f^2 = .104$. For Step 2: $R^2 = .111$, $\Delta R^2 = .017$, $F(2, 307) = 2.907$, $p = .056$, Cohen's $f^2 = .017$. MSPSS = Multidimensional Scale of Perceived Social Support, PHQ-9 = Patient Health Questionnaire, DHFKS = Dutch Heart Failure Knowledge Scale, SIBHF = Survey of Illness Beliefs in Heart Failure.

Exploratory Analyses and Results

Given the results regarding the mean accuracy of HF beliefs, exploratory bivariate correlations were conducted between specific individual HF beliefs and self-care confidence. Beliefs that were related to the consequences of HF were not correlated with self-care confidence at the $p < .05$ level. Some beliefs regarding control (e.g., "[HF] is an illness that I cannot influence by my behavior." [reversed]) were correlated with self-care confidence in the expected direction, though not all were.

Discussion

The present study examined the role of self-care confidence in HF. It was hypothesized that greater self-care confidence would predict lower levels of depression and that self-care confidence would moderate a relationship between greater HF symptom burden and greater levels of depression, such that HF symptoms would have a weaker relationship with depression when reported levels of self-care confidence were high. Additionally, it was hypothesized that greater HF knowledge and more accurate beliefs about HF would predict greater self-care confidence. The results of the present study suggest that greater self-care confidence does predict lower levels of depression ($p = .009$), which supports Hypothesis 1. Although a positive linear relationship was found between greater symptom burden and depression, the present study did not find that self-care confidence moderated this relationship. Thus, Hypothesis 2 was supported, though Hypothesis 3 was not. Regarding the additional hypotheses, a relationship between greater HF knowledge and self-care confidence was found to approach statistical significance ($p = .08$) but did not meet the $p = .05$ threshold. Thus, Hypothesis 4 was not fully supported. The present study did not find a statistically significant relationship between the accuracy of HF beliefs as a whole and self-care confidence. Thus, Hypothesis 5 was not supported. Exploratory correlations revealed that some specific HF beliefs related to personal control (e.g., "[HF] is an illness that I cannot influence by my behavior." [reversed]) were correlated with self-care confidence in the expected direction, whereas beliefs that were specifically related to the consequences of HF were not.

Although a previous study (Cameron et al., 2010) reported that depression was associated with poorer self-care confidence, the present study contributes that the relationship might be bidirectional, and that the modifiable variable of self-care confidence can predict depression. Thus, interventions that increase self-care confidence could be clinically beneficial. Mechanisms by which self-care confidence might impact depression in HF are not yet known. Previous studies have indicated that an important risk factor for depression in HF is poor or worsening health, as measured by a larger symptom burden, higher NYHA classification, and lower LVEF (Altay et al., 2012; Lossnitzer et al., 2013; Kao et al., 2014; Seo et al., 2014; Graven et al., 2017; Zahid et al., 2018). The present study's finding that the KCCQ symptoms subscale predicted greater levels of depression corroborates the existing literature. One proposed mechanism for the influence of self-care confidence on depression is that higher levels of self-care confidence might moderate the relationship between HF symptoms and depression. However, the present study did not find such a moderation effect. At least one study has suggested that self-care confidence predicts self-care behaviors in HF (Chuang, Kao, Lin, & Chang, 2019). If greater adherence to self-care behaviors reduces one's HF symptom burden, then it might be plausible that self-care behavior and HF symptom burden could be mediating variables in the relationship between self-care confidence and depression. Future studies should attempt to investigate this mechanism or other potential mechanisms by which self-care confidence might impact depression.

The present study contributes to a relatively small literature of studies examining potential predictors of self-care confidence in heart failure. One study found that poorer self-care confidence was predicted by advanced age and by depressive symptoms (Cameron et al., 2010), and another found that stronger social support predicted better self-care confidence (Fivecoat, Sayers, & Riegel, 2018). The present study observed whether the variables of HF knowledge and

accurate beliefs about HF might predict self-care confidence independently of previously demonstrated predictors (e.g., age, depression, social support). As previously mentioned, the present study's result regarding HF knowledge approached significance ($p = .08$) but did not meet the $p = .05$ threshold. Although the analyses appeared to be adequately powered, perhaps if the observed effect size or sample size were slightly larger a positive effect might have been found. The lack of a statistically significant result contrasts somewhat with a literature of studies that examined the influence of HF education programs on HF knowledge and self-care confidence. Four previous studies found that an education program made a significant improvement in HF knowledge relative to a control condition (Liou et al., 2015; Srisuk et al., 2017; Tawalbeh, 2018; Dinh et al., 2019), and all but one of these studies (Dinh et al., 2019) also found a significant improvement in self-care confidence. Yet, the present study did not find HF knowledge to be a statistically significant predictor of self-care confidence. Perhaps there is an element inherent to the education program other than having a high level of HF knowledge that might increase self-care confidence. For example, perhaps the experience of being taught or supported by health professionals increases confidence; or perhaps the *improvement* of knowledge rather than a raw level of knowledge increases confidence. Another potential consideration is the role of health literacy. Adequate health literacy has been positively associated with both self-care confidence (Dennison et al., 2011) and HF knowledge (Hawkins et al., 2016). Perhaps literacy has a stronger relationship with confidence than does knowledge. Finally, while the present study observed approximations of participants' actual HF knowledge level, it did not take into account participants' *perception* of their knowledge level. Perhaps participants' *perception* of their HF knowledge is a stronger predictor of their confidence than their actual knowledge. Further, it might be possible that some participants perceive their HF

knowledge to be greater than it is and become susceptible to a phenomenon known as the "Dunning–Kruger effect" (Kruger & Dunning, 1999).

The present study did not find more accurate beliefs about HF to predict greater self-care confidence. In contrast, belief in the coherence of one's illness and beliefs about the necessity of medication have previously been demonstrated to be correlated with self-care (MacInnes, 2013). One potential explanation is that the full range of beliefs assessed in the Survey of Illness Beliefs in Heart Failure is too broad as a whole to be associated specifically with self-care confidence and that the role of more specific beliefs or specific themes of beliefs should be examined. In the present study, beliefs that were specific to the consequences of HF were not correlated with self-care confidence. However, some specific beliefs related to care were correlated in the expected direction (e.g., "Heart failure is an illness that I cannot influence by my behavior" [reversed]; "Heart failure needs treatment even if I feel fine"; "Heart failure plan of care must be followed forever"). Further research is needed to more conclusively establish whether specific themes of belief might be associated with self-care confidence.

The present study appears to be the first to demonstrate that depression in HF can be predicted by self-care confidence. Given that depression is highly prevalent in HF (Wallenborn & Angermann, 2013), is one of the leading causes of disability in the world (Friedrich, 2017), and is associated with poorer outcomes in HF (Rutledge et al., 2006; Lee et al., 2014; Gathright et al., 2017), identification of predictors of depression in HF is extremely important. Because treatment approaches for depression in HF are limited in efficacy, infrastructure, or adherence, prevention is crucial. Thus, identification of self-care confidence as a modifiable predictor could be instrumental both for early detection and prevention of depression in HF. The present study also corroborated past research that HF symptom burden predicts depression, but further study is

needed to determine the mechanism by which self-care confidence impacts depression. For example, perhaps self-care confidence predicts self-care behavior, which might reduce HF symptom burden and attenuate risk for depression. Relatively few studies have examined potential predictors for self-care confidence in HF. Although the present study did not find that HF knowledge or HF beliefs predicted self-care confidence, future studies may observe potential predictors as well as potential means to increase self-care confidence. Such interventions could be clinically beneficial.

Limitations

Some limitations of the present study should be mentioned. Although data collection occurred over several time points, the data collection was arranged in such a way that the study's research question could not be evaluated with a longitudinal mediation analysis, nor could causation be established. The potential relationships examined might be bidirectional (e.g., greater self-care confidence might predict less depression and greater depression might predict less self-care confidence). The research question for the present study explores directions of influence using predictors that may be modifiable via intervention (e.g., self-care confidence, HF knowledge, HF beliefs), but other directions of influence might be possible as well. Treatment approaches for depression in HF include antidepressants (Das et al., 2019; O'Connor et al., 2010), cognitive behavioral therapy (Jeyanantham et al., 2017), and exercise training (Tu et al., 2014). However, data regarding these variables were not available for the present study for comparison with the influence of self-care confidence. This may be examined in future studies.

Future Directions

The present study's findings and limitations suggest the potential for several future studies. Although the present study demonstrated that greater self-care confidence predicts less

depression, potential mechanisms for the influence of self-care confidence need to be examined further, ideally with longitudinal or mediation designs. Additionally, future studies could compare the relative influences of treatment approaches for depression (e.g., antidepressants, cognitive behavioral therapy, and exercise training) with prevention strategies such as monitoring and improving self-care confidence. Further, potential predictors for self-care confidence should continue to be explored; and interventions that might increase self-care confidence, such as education programs or other approaches, could be established. Because there has been conflicting data regarding the role of illness beliefs, future research could explore how specific beliefs might impact self-care confidence. Lastly, the longitudinal course of depression in HF should be explored and other potential predictors of depression could be suggested.

Conclusion

The present study demonstrated that self-care confidence predicts depression in HF as well as corroborated past studies that have shown that poor or worsening health is associated with greater depression. Future research is needed to explore potential mechanisms for the influence of self-care confidence on depression as well as predictors and mechanisms of increasing self-care confidence, ideally with longitudinal designs. Healthcare professionals should continue to screen HF patients for depression symptoms and, based on the present study's findings, it could be clinically beneficial to monitor for self-care confidence and provide self-care education where needed. Researchers may further examine the influence of self-care confidence in the long term as well as continue to explore prevention methods against depression in HF.

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APPENDIX A

IRB CONSENT FORM

INFORMED CONSENT

SUMMA Health System

KENT STATE UNIVERSITY

Project Title: Self-management and Cardiac Disease
Principal Investigator: Joel W. Hughes, PhD

Introduction

You are being asked to participate in a research study because you have been diagnosed with heart failure. The purpose of the study is to identify the relationships among cognitive function, self-management, and health services use. Before you can decide whether or not to volunteer for this study, you must be informed of the purpose of the research study, how this study may help you, any risks to you, and what is expected of you. This process is called "informed consent."

You do not have to participate in this study. You may stop your participation in this study at any time without affecting your current or future care at Summa Health System or with its doctors.

If you decide to participate in this study you will be told about any new information learned during the course of the study that might cause you to change your mind about staying in the study.

Why is this study being done?

This study is being done so that we can look at factors which may be associated with how someone with heart failure manages their illness. These factors are things like how you think and what you remember (cognitive function).

We are also interested in how self-management (a patient's ability to manage their care) relates to how they use health services. Patients with heart failure are an important group of people to study because of the high risk of complications and high medical costs associated with heart failure. Information gained from this project will be used to identify patients who have trouble thinking and remembering and to create ways to help patients manage their care.

How many people will take part in this study?

There will be approximately 400 people who participate in this study.

SUMMA Health System

KENT STATE UNIVERSITY

Who can be in this study?

We will offer participation in this study to people who are 50-85 years of age, who have been diagnosed with heart failure, and who have a telephone at their home.

What is involved in this study?

There will be 4 study visits which will take place at the hospital or in your home over about two months.

Study Visit 1

Study visit 1 will take place during a hospital stay or on the same day as your doctor appointment. During this visit you will complete questionnaires and complete cognitive testing which includes answering questions and performing simple procedures. You will also complete a 2-minute "step test" in which the number of steps you can take in 2-minutes is counted. Altogether, this will take about 60 minutes.

Study Visit 2

Within the 2 weeks after study visit 1, a research assistant will come to your home and will train you on how to use an electronic pill box and weight scale. The research assistant will deliver these devices to your home. The electronic pill box and the weight scale are connected by your telephone line to a computer used by the research team. There will be no extra phone charges. The research assistant will also provide you with a 24-hour urine collection container and will repeat the cognitive testing. This will take 90 minutes.

Study Visit 3

Seven days after study visit 2, the research assistant will return to your home and will collect the 24-hour urine sample, and will provide you with another 24-hour urine collection container. They will perform a pill count to check the accuracy of the electronic pill box, and answer any questions you have since study visit 2. This will take 60 minutes.

Study Visit 4

The research assistant will return to your home 21 days after study visit 3. During

this visit the research assistant will collect the electronic pill box and weight scale and the 24-hour urine collection. During this visit you will also repeat the cognitive testing. This will take 30 minutes.

Additional Study Procedures
In addition to the study visits, we will be collecting your personal data every month for 12 months. This will consist of making telephone calls to you to collect information, and having you complete a health service use calendar. You will be sent a new health service use log and contacted by telephone every 3 months (for 12 months) to obtain data regarding phone calls to health providers, scheduled and unscheduled medical visits, and re-hospitalizations.

We may like to contact you after the completion of this study for future research studies of health service use and cognitive function. Participation of these future study opportunities is strictly voluntary, and you may refuse to be contacted for further research. Please indicate your interest in being contacted for future studies:

___ Yes, I agree to be contacted for possible future research studies
___ No, I do not want to be contacted for possible future research studies

Assessment of Cognitive Functioning
We will collect information on how you think (cognitive status) at study visits 1, 2, and 4 by asking you to take some short tests. These tests will look at your general thinking ability, memory, ability to pay attention, and ability to quickly make decisions. These tests involve working puzzles, answering questions, learning words, and other simple tasks that are designed to challenge your thinking and memory.

Questionnaires
You will be asked to complete questionnaires that ask about things like your health behaviors, diet, social support and your relationships, depression, anxiety, sleep quality, sleepiness, symptom severity, and knowledge of heart failure self-care. We will also ask about demographic information such as marital status, number of children, lifestyle habits such

as cigarette smoking and alcohol use, living arrangements, education level, and health literacy.

Some of the questionnaires are completed as an interview, and some are for you to fill out.

Urine Collection
You will be asked to collect urine over the course of 24 hours prior to study visits 3 and 4. You will be asked to store your urine in your refrigerator at home or in a portable cooler which we will provide to you. Urine must be kept cold throughout the 24-hour period. The research assistant will collect the stored urine at the study visit. This urine will be used to provide an estimate of how much salt you eat.

Pill Box
You will be asked to store your medications in an electronic pill box which we will provide to you for your use for 4 weeks (from study visit 2 to study visit 4). You will use the pill box to dispense your medications. We will ask you to complete a pill log to track any changes to how you use the pill box. In addition to tracking your pill use with the electronic pill box, you will also be asked to record any changes to your medications, like skipping doses on purpose.

Daily Weight
We will ask you to monitor your weight daily on a scale which we provide to you.

- We will collect the electronic pill boxes and weight scale from you at the end of Study Visit 4.

Medical Records
We will also be accessing your medical records for heart failure history, etiology (i.e., what may be causing your medical condition), and hospitalization.

Will any of the samples (urine) taken from me be used for other research studies?

The urine sample we take from you will not be used for any other purposes except those described in this consent form.

What happens if I discontinue or withdraw from the study?

You are participating in this study of your own free will and we realize that you can change your mind. You may stop your participation in this study at any time without changing your current or future care at Summa Health System or with its doctors.

What are the risks of this study?

Your participation in the study may include the following risks. The questionnaires may make you feel uncomfortable. There is a small risk of falling during or after the 2 minute step test. There may also be a possibility of your personal health information being lost or misplaced. We will also keep any study data we collect from you in a locked cabinet or computer file. Only authorized research personnel will have access to your data.

If we find that you are having changes in feelings of depression or thinking and memory problems we will help you and notify your health care provider.

Possible benefits:

There is no direct benefit from participation in this research study. The information that you contribute may benefit other patients with heart failure in the future.

Options:

Because of the nature of this research, the only alternative is to not participate in this study.

Confidentiality:

Your name will not be used in any written or oral report of the study. A number will be used on all information supplied by you. This information will be known

only to the study staff.

Costs:

There is no cost to you or your insurance for participation in this study. Any equipment needed will be provided to you free of charge and you will have no financial liability for it.

Compensation:

You will be compensated with a monetary payment of $300 if you complete all the parts of the study. The breakdown of payments is as follows: $50 after visits 1, 2, 3, and 4. $25 for each follow-up telephone call. There are4 follow-up calls. All together this adds up to $300.

Contact information

_____ has described to you what is going to be done, the risks, hazards, and benefits involved. The Principal Investigator, Joel Hughes, can also be contacted at 330-672-7721 during the day. If you have a medical emergency please call 911. . You may ask any questions you have now. If you have any questions, concerns or complaints about the study in the future, you may also contact them later.

If you have questions about your rights as a research subject, please call the Institutional Review Board (IRB) at Summa Health Systems (330-375- 4045). This is a group of people who work to protect research subjects' rights. If you have questions about Kent State University's rules for research, please call the dean of the Division of Research and Graduate Studies at Kent State University (330-672-0700).

Signature

Signing below indicates that you have been informed about the research study in which you voluntarily agree to participate; that you have asked any questions about the study that you may have; and that the information given to you has permitted you to make a fully informed and free decision about your participation

INFORMED CONSENT

SUMMA Health System

KENT STATE UNIVERSITY

in the study. By signing this consent form, you do not waive any legal rights, and the investigator(s) or sponsor(s) are not relieved of any liability they may have. A copy of this consent form will be provided to you.

_____ Date_____

_____

Signature of Participant Printed Name of Participant

_____ Date_____

_____

Signature of Person Obtaining Consent Printed Name of Person Obtaining Consent

(Must be study investigator or individual who has been designated in the Checklist to obtain consent.)

_____ Date_____

_____

Signature of Principal Investigator Printed Name of Principal Investigator
(Affirming subject eligibility for the Study and that informed consent has been obtained.)

APPENDIX B

STUDY MEASURES

SELF-CARE OF HEART FAILURE INDEX + HEALTH UTILIZATION QUESTIONNAIRE

All answers are confidential.

Think about how you have been feeling in the last month or since we last spoke as you complete these items.

SECTION A:

Listed below are common instructions given to persons with heart failure. How routinely do you do the following?

	Never or rarely	**Sometimes**	**Frequently**	**Always or daily**
1. Weigh yourself?	1	2	3	4
2. Check your ankles for swelling?	1	2	3	4
3. Try to avoid getting sick (e.g., flu shot, avoid ill people)?	1	2	3	4
4. Do some physical activity?	1	2	3	4
5. See your doctor or nurse?	1	2	3	4
6. Eat a low salt diet?	1	2	3	4
7. Exercise for 30 minutes?	1	2	3	4
8. Forget to take one of your medicines?	1	2	3	4
9. Ask for low salt items when eating out or visiting others?	1	2	3	4
10. Use a system (pill box, reminders) to help you remember your medicines?	1	2	3	4

SECTION B:
Many patients have symptoms due to their heart failure. Trouble breathing, weight gain, and ankle swelling are common symptoms of heart failure.

In the past month, have you had trouble with any of the following symptoms?
Circle all that apply.

0) Trouble breathing
1) Ankle swelling
2) Weight gain of at least 3 pounds over 3 days

11. If you had trouble breathing in the past month…
(circle **one** number)

	Have not had these	**I did not recognize it**	**Greater than 1 wk**	**About one week**	**Few days**	**Same day**
How quickly did you recognize it as a symptom of heart failure?	N/A	0	1	2	3	4

12. What did you do about it?
_____

13. If you had experience sudden weight gain in the past month…
(circle **one** number)

	Have not had these	**I did not recognize it**	**Greater than 1 wk**	**About one week**	**Few days**	**Same day**
How quickly did you recognize it as a symptom of heart failure?	N/A	0	1	2	3	4

14. What did you do about it?
_____

15. If you had ankle swelling in the past month…
(circle **one** number)

	Have not had these	**I did not recognize it**	**Greater than 1 wk**	**About one week**	**Few days**	**Same day**
How quickly did you recognize it as a symptom of heart failure?	N/A	0	1	2	3	4

16. What did you do about it?

_____

Listed below are remedies that people with heart failure use. If you have trouble breathing or ankle swelling, how likely are you to try one of these remedies?

(circle **one** number for each remedy)

	Not Likely	**Somewhat Likely**	**Likely**	**Very Likely**
17. Reduce the salt in your diet	1	2	3	4
18. Reduce your fluid intake	1	2	3	4
19. Take an extra water pill	1	2	3	4
20. Call your doctor or nurse for guidance	1	2	3	4

21. Think of a remedy you tried the last time you had trouble breathing or ankle swelling,

(circle **one** number)

	I did not try anything	**Not Sure**	**Somewhat Sure**	**Sure**	**Very Sure**
How sure were you that the remedy helped or did not help?	0	1	2	3	4

SECTION C:
In general, how confident are you that you can:

	Not Confident	Somewhat Confident	Very Confident	Extremely Confident
22. Keep yourself free of heart failure symptoms?	1	2	3	4
23. Follow the treatment advice you have been given?	1	2	3	4
24. Evaluate the importance of your symptoms?	1	2	3	4
25. Recognize changes in your health if they occur?	1	2	3	4
26. Do something that will relieve your symptoms?	1	2	3	4
27. Evaluate how well a remedy works?	1	2	3	4

SECTION D: Health Utilization

28. In the past month, have you called your doctor? (circle one)
    0) No
    1) Yes
29. If yes, why did you call?
    _____
30. In the past month, did you visit the doctor? (circle one)
    2) No
    3) Yes
31. If yes, why did you go?
    _____
32. In the past month, have you gone to the emergency room or been hospitalized? (circle one)
    4) No
    5) Yes
33. If yes, why did you go?
    _____

The KC Cardiomyopathy Questionnaire

The following questions refer to your **heart failure** and how it may affect your life. Please read and complete the following questions. There are no right or wrong answers. Please mark the answer that best applies to you.

1. **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.

Place an **X** in one box on each line

Activity	Extremely Limited	Quite a bit Limited	Moderately Limited	Slightly Limited	Not at all Limited	Limited for other reasons or did not do the activity
Dressing yourself	☐	☐	☐	☐	☐	☐
Showering/Bathing	☐	☐	☐	☐	☐	☐
Walking 1 block on level ground	☐	☐	☐	☐	☐	☐
Doing yardwork, housework or carrying groceries	☐	☐	☐	☐	☐	☐
Climbing a flight of stairs without stopping	☐	☐	☐	☐	☐	☐
Hurrying or jogging (as if to catch a bus)	☐	☐	☐	☐	☐	☐

2. Compared with 2 weeks ago, have your symptoms of **heart failure** (shortness of breath, fatigue, or ankle swelling) changed?

My symptoms of **heart failure** have become…

Much worse	Slightly worse	Not changed	Slightly better	Much better	I've had no symptoms over the last 2 weeks
☐	☐	☐	☐	☐	☐

Original US English

3. 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
☐	☐	☐	☐	☐

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

It has been ...

Extremely bothersome	**Quite a bit** bothersome	**Moderately** bothersome	**Slightly** bothersome	**Not at all** bothersome	I've had **no swelling**
☐	☐	☐	☐	☐	☐

5. 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 per day	At least once a day	3 or more times per week but not every day	1-2 times per week	Less than once a week	Never over the past 2 weeks
☐	☐	☐	☐	☐	☐	☐

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

It has been ...

Extremely bothersome	**Quite a bit** bothersome	**Moderately** bothersome	**Slightly** bothersome	**Not at all** bothersome	I've had **no fatigue**
☐	☐	☐	☐	☐	☐

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

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

Original US English

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

It has been ...

Extremely bothersome	**Quite a bit** bothersome	**Moderately** bothersome	**Slightly** bothersome	**Not at all** bothersome	I've had **no shortness of breath**
☐	☐	☐	☐	☐	☐

9. 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 night	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
☐	☐	☐	☐	☐

10. **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
☐	☐	☐	☐	☐

11. 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
☐	☐	☐	☐	☐

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

It has **extremely** limited my enjoyment of life	It has limited my enjoyment of life **quite a bit**	It has **moderately** limited my enjoyment of life	It has **slightly** limited my enjoyment of life	It has **not limited** my enjoyment of life at all
☐	☐	☐	☐	☐

13. 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?

Not at all satisfied	Mostly dissatisfied	Somewhat satisfied	Mostly satisfied	Completely satisfied
☐	☐	☐	☐	☐

Original US English

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

I felt that way **all of the time**	I felt that way **most of the time**	I **occasionally** felt that way	I **rarely** felt that way	I **never** felt that way
☐	☐	☐	☐	☐

15. 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.

Please place an **X** in one box on each line

Activity	**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
Hobbies, recreational activities	☐	☐	☐	☐	☐	☐
Working or doing household chores	☐	☐	☐	☐	☐	☐
Visiting family or friends out of your home	☐	☐	☐	☐	☐	☐
Intimate relationships with loved ones	☐	☐	☐	☐	☐	☐

Original US English

PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

NAME: _____ **DATE:** _____

Over the *last 2 weeks*, how often have you been bothered by any of the following problems? *(use "✓" to indicate your answer)*	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself in some way	0	1	2	3
	add columns:		+	+
(Healthcare professional: For interpretation of TOTAL, please refer to accompanying scoring card.)	**TOTAL:**			

10. If you checked off *any* problems, how *difficult* have these problems made it for you to do your work, take care of things at home, or get along with other people?

- **Not difficult at all** _____
- **Somewhat difficult** _____
- **Very difficult** _____
- **Extremely difficult** _____

ZT242043

DUTCH HEART FAILURE KNOWLEDGE SCALE

This list contains a number of questions and statements about heart failure. Please place an X on the line that matches what you think is the right answer (place an X on 1 line per question).

1. How often should patients with severe heart failure weigh themselves?

_____ every week
_____ now and then
_____ every day

2. Why is it important that patients with heart failure should weigh themselves regularly?

_____ because many patients with heart failure have a poor appetite
_____ to check whether the body is retaining fluid
_____ to assess the right dose of medicines

3. How much fluid are you allowed to take at home each day?

_____ 1.5 to 2.5 liters at the most
_____ as little fluid as possible
_____ as much fluid as possible

4. Which of these statements is true?

_____ when I cough a lot, it is better not to take my heart failure medication
_____ when I am feeling better, I can stop taking my medication for heart failure.
_____ it is important that I take my heart failure medication regularly

5. What is the best thing to do in case of increased shortness of breath or swollen legs?

_____ call the doctor or the nurse
_____ wait until the next check-up
_____ take less medication

6. What can cause a rapid worsening of heart failure symptoms?

_____ a high-fat diet
_____ a cold or the flu
_____ lack of exercise

7. What does heart failure mean?

_____ that the heart is unable to pump enough blood around the body
_____ that someone is not getting enough exercise and is in poor condition
_____ that there is a blood clot in the blood vessels of the heart

8. Why can the legs swell up when you have heart failure?

_____ because the valves in the blood vessels in the legs do not function properly
_____ because the muscles in the legs are not getting enough oxygen
_____ because of accumulation of fluid in the legs

DUTCH HEART FAILURE KNOWLEDGE SCALE

9. What is the function of the heart?

_____ to absorb nutrients from the blood
_____ to pump blood around the body
_____ to provide the blood with oxygen

10. Why should someone with heart failure follow a low salt diet?

_____ salt promotes fluid retention
_____ salt causes constriction of the blood vessels
_____ salt increases the heart rate

11. What are the main causes of heart failure?

_____ a myocardial infarction and high blood pressure
_____ lung problems and allergy
_____ obesity and diabetes

12. Which statement about exercise for people with heart failure is true?

_____ it is important to exercise as little as possible at home in order to relieve the heart
_____ it is important to exercise at home and to rest regularly in between
_____ it is important to exercise as much as possible at home

13. Why are water pills prescribed to someone with heart failure?

_____ to lower the blood pressure
_____ to prevent fluid retention in the body
_____ because then they can drink more

14. Which statement about weight increase and heart failure is true?

_____ an increase of over 1 pound in 2 or 3 days should be reported to the doctor at the next check-up
_____ in case of an increase of over 4 pounds in 2 or 3 days, you should contact your doctor or nurse
_____ in case of an increase of over 1 pound in 2 or 3 days, you should eat less

15. What is the best thing to do when you are thirsty?

_____ suck an ice cube
_____ suck a salty lozenge
_____ drink a lot

M.H.L. van der Wal, T. Jaarsma; June 2003

Survey of Illness Beliefs in Heart Failure

Directions: This survey provides 14 statements that might describe what heart failure means to you, including your beliefs and understanding about heart failure. The purpose is to learn what you believe about heart failure. Read each statement then circle the best response:

strongly disagree (SD) disagree (D) agree (A) or strongly agree (SA).

Choose *strongly* disagree or *strongly* agree if you are very certain that the statement is something you believe.

Answer each statement as best as you can. It is important for you to respond to each statement based on your actual beliefs and not on how you think you should respond to each statement.

Heart failure….	**Strongly** Disagree	**Disagree**	**Agree**	**Strongly** Agree
1. Is an illness that I cannot influence by my behavior.	SD	D	A	SA
2. Is something I go "in" and "out" of.	SD	D	A	SA
3. Is present only when symptoms are present.	SD	D	A	SA
4. Can be cured with drugs and other therapies.	SD	D	A	SA
5. Requires me to drink fluids, especially when I feel thirsty.	SD	D	A	SA
6. Can occur silently (without signs or symptoms).	SD	D	A	SA
7. Is likely to shorten my life (cause premature death).	SD	D	A	SA
8. Drugs work best when I have symptoms.	SD	D	A	SA
9. Can get worse by my lifestyle behaviors or actions.	SD	D	A	SA
10. Can be disabling.	SD	D	A	SA
11. Is a threat to my health.	SD	D	A	SA
12. Needs treatment even if I feel fine.	SD	D	A	SA
13. May improve with drugs and a lot of time.	SD	D	A	SA
14. Plan of care (drugs, diet…) must be followed forever.	SD	D	A	SA

Thank you for completing this survey.

Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet & Farley, 1988)

Instructions: We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement.

Circle the "1" if you **Very Strongly Disagree**
Circle the "2" if you **Strongly Disagree**
Circle the "3" if you **Mildly Disagree**
Circle the "4" if you are **Neutral**
Circle the "5" if you **Mildly Agree**
Circle the "6" if you **Strongly Agree**
Circle the "7" if you **Very Strongly Agree**

1.	There is a special person who is around when I am in need.	1	2	3	4	5	6	7	SO
2.	There is a special person with whom I can share my joys and sorrows.	1	2	3	4	5	6	7	SO
3.	My family really tries to help me.	1	2	3	4	5	6	7	Fam
4.	I get the emotional help and support I need from my family.	1	2	3	4	5	6	7	Fam
5.	I have a special person who is a real source of comfort to me.	1	2	3	4	5	6	7	SO
6.	My friends really try to help me.	1	2	3	4	5	6	7	Fri
7.	I can count on my friends when things go wrong.	1	2	3	4	5	6	7	Fri
8.	I can talk about my problems with my family.	1	2	3	4	5	6	7	Fam
9.	I have friends with whom I can share my joys and sorrows.	1	2	3	4	5	6	7	Fri
10.	There is a special person in my life who cares about my feelings.	1	2	3	4	5	6	7	SO
11.	My family is willing to help me make decisions.	1	2	3	4	5	6	7	Fam
12.	I can talk about my problems with my friends.	1	2	3	4	5	6	7	Fri

The items tended to divide into factor groups relating to the source of the social support, namely family (Fam), friends (Fri) or significant other (SO).