Heart Failure Patients' Perceptions of Preparation for Self-care

Valrie Evadne Reid
Florida International University, vreid004@fiu.edu

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HEART FAILURE PATIENTS’ PERCEPTIONS OF PREPARATION FOR SELF-CARE

A dissertation submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

NURSING

by

Valrie Evadne Reid

2020
To: Dean Ora Strickland
Nicole Wertheim College of Nursing and Health Sciences

This dissertation, written by Valrie Reid, and entitled Heart Failure Patients’ Perceptions of Preparation for Self-care, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this dissertation and recommend that it be approved.

________________________________________
Timothy Page

________________________________________
JoAnne Youngblut

________________________________________
Dorothy Brooten, Co-Major Professor

________________________________________
Jean Hannan, Co-Major Professor

Date of Defense: November 05, 2020

The dissertation of Valrie Reid is approved.

________________________________________
Dean Ora Strickland Nicole Wertheim College of Nursing and Health Sciences

________________________________________
Andrés G. Gil
Vice President for Research and Economic Development and Dean of the University Graduate School

Florida International University, 2020
DEDICATION

I dedicate this dissertation to my family, past and present, whose lives made this work possible. I owe a lifetime of gratitude to my maternal grandmother, Lennie McLeod Alcock for giving me a love of knowledge. My father Enoch Reid has always been my most ardent supporter believing there is nothing I cannot do. Countless prayers by my mother Cachita Ennis and tangible support from my stand-in mothers (Pauline Reid, Dorothy McIntosh and Hazel Scott) provided a launching pad for this journey. Without the trusted support of my brother Calvin, I could not have completed this dissertation. Although my sister Colleen left us a year ago, her legacy lives on. Her favorite expression ‘we all we got’ reminds me that the support of family is our greatest asset.
ACKNOWLEDGEMENTS

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I thank the Heart Failure Society of America for their generous support in funding this dissertation research. The Florida International University Office of Research and Economic Development pre-award and post-award staff have been unfailing in their support managing my grant.

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ABSTRACT OF THE DISSERTATION

HEART FAILURE PATIENTS’ PERCEPTIONS OF PREPARATION FOR SELF-CARE

by

Valrie Reid

Florida International University, 2020

Miami, Florida

Professor Dorothy Brooten, Co-Major Professor

Professor Jean Hannan, Co-Major Professor

Advanced practice nurse (APN) home visits and targeting perceived preparation for heart failure (HF) self-care indicated improved outcomes. Less is known about targeting these perceptions with inexpensive APN interventions.

Purpose: This randomized clinical trial compared health outcomes, and charges between two groups hospitalized with HF.

Methods: A control (n=78) group received routine postdischarge care. An intervention group (n=76) received routine care plus telephone calls by APNs at 7 timepoints for 8 weeks. Both groups were for health outcomes, healthcare charges, and APN charges.

Findings: Compared to the control group, the intervention group had significant differences in perceived preparation for self-care mean scores, hospital readmission rate, and healthcare charges.

Conclusion: APN telephone interventions targeted at subjective perceptions resulted in significantly higher levels of perceived preparation for self-care, lower rehospitalization...
rates and lower healthcare charges in the intervention group compared to the control group that did not receive APN interventions.
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<td>ACEI</td>
<td>Angiotensin Converting Enzyme Inhibitor</td>
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<td>AHA</td>
<td>American Heart Association</td>
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<td>AldA</td>
<td>Aldosterone Antagonist</td>
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<td>APN</td>
<td>Advanced Practice Nurse</td>
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<td>Care Transition Measure</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>HF</td>
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<td>HRRP</td>
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<td>Incremental Cost Effectiveness Ratio</td>
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<td>QALY</td>
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CHAPTER I.
INTRODUCTION

Heart Failure (HF) patients face dauntingly complex treatment regimens, high healthcare usage and high economic burden using the current healthcare delivery models and most are not prepared to perform their self-care (Patel et al., 2018). This chronic condition is a growing public health problem affecting 6.5 million people in the United States and is the leading cause of hospital admissions and multiple readmissions for older adults (Dharmarajan et al., 2017; Benjamin et al., 2019). Projections indicate the prevalence of HF diagnosis will increase by 46% from 2012 to 2030, resulting in over 8 million living with HF (Benjamin et al., 2019). High patient hospitalization rates account for nearly 80% of HF costs with over 20% of HF patients readmitted within the first 30 days following care transition from hospital to home (Dharmarajan et al., 2017). Federal legislation penalizes hospitals for high readmission rates, resulting in reduced healthcare use and increased mortality rates (Goldgrab et al., 2018). Investigators analyzing national trends suggested the interventions that have shown to be most effective in improving HF patients’ health outcomes focus on the identification and removal of issues contributing to non-adherence to medicine and dietary HF self-care guidelines (Goldgrab et al., 2018). Optimal HF self-care improves quality of live, reduces emergency and hospital use, and mortality rates (Yancy et al., 2016). However, these HF self-care regimens are complex. Culture, beliefs and customs substantially influence how patients understand their health, their health seeking behaviors and how they make decisions related to their health (self-care) (Agency for Healthcare Research and Quality, 2015). Given the complex treatment regimens for HF self-care, there are very limited data on HF patients’ perceptions of their
readiness for hospital discharge and their perceptions for preparation to perform their self-care. Such data can guide the development of practice models that will identify the timing of low and high self-perceived preparedness for home self-care, and issues contributing to non-adherence to medicine and dietary HF self-care guidelines.

**Significance**

**Population of Heart Failure Patients**

Heart attack and uncontrolled high blood pressure contribute to 1 million new cases of HF diagnosed in the U.S. each year (Benjamin et al., 2019). Seventy-eight percent of patients with HF are over 60 years of age and have other multiple comorbid conditions (Feltner et al., 2014). Despite substantial benefits indicated from guidelines developed in clinical intervention trials (pharmacological, surgical and supportive), HF health outcomes remain poor (Benjamin et al., 2019). This condition is characterized by a series of decompensations, after which patients do not return to their baseline health state. They require higher intensity of care that signals a progressive downward course until heart pump failure and death occurs (Dharmarajan et al., 2017). After a diagnosis of HF, more than 50% die within 5 years accounting for 1 in 8 deaths (Ambrosy et al., 2014; Goldgrab et al., 2018). There is a high hospitalization rate with over 20% of HF patients readmitted within 30 days of hospital discharge (Benjamin et al., 2019). This early readmission is associated with high cost and higher mortality rates with over a third (36.3%) of HF patients dying within one year of hospitalization (Gupta et al., 2018). The incidence of HF in the US occurs equally in men and women. However, there is the exception of race; Black Americans are 1.5 times more likely to develop HF than Whites Americans (Benjamin et al., 2019). Moreover, compared to Whites, racial/ethnic
minorities also have a greater risk of dying from HF. Studies indicate that the higher mortality rates in racial/ethnic minorities have been associated with the increased prevalence of health risks that cause HF such as reluctant patterns of health seeking behaviors and nonadherence to regimens (Bejamin et al., 2019; Riegel, Dickson, & Faulkner, 2016).

**Heart Failure Healthcare Costs**

As the leading cause of hospital admissions for elders, HF healthcare delivery is a considerable economic burden on the federal government (Heidenreich et al., 2013). Health spending in the U.S. grew from 5% of the gross domestic product (GDP) in 1960 to almost 18% of the GDP in 2015, adding up to $3.2 trillion, an average of $9,990 per person (Soundarraj, Singh, Satija, & Thakur, 2017). However, half of all Americans receive little or no benefit from healthcare spending while a small amount (5%) are consistently high users and are responsible for 50% of the expenditures (Pritchard et al., 2016). The cost for HF treatment is 7 to 10 times more than any other single condition (Pritchard et al., 2016). The economic burden of HF is expected to increase due to an aging population and improved survival rates from heart attacks and uncontrolled high blood pressure (Benjamin et al., 2019). The high cost of HF treatment is associated with the use of emergency visits and hospitalizations for acute decompensation of the chronic condition (Soundarraj et al., 2017). At $50 billion each year in direct medical costs, expenditures are projected to increase by 127% by the year 2030 to provide care for Americans with a HF diagnosis (Benjamin et al., 2019). This projection includes an increase in direct costs to $53.1 billion and the remainder due to indirect costs from out-of-pocket expenses and lost productivity associated with HF morbidity and mortality.
(Soundarraj et al., 2017). Given these projected increase HF costs, studies are needed to develop practice models that identify and remove issues contributing to the leading cause of HF related healthcare use, non-adherence to medicine and dietary HF self-care guidelines.

**Heart Failure Follow-up Interventions**

Even though national attention to improve HF health outcomes focuses on reforming hospital and emergency practices, research indicates over 73% of older adults experienced self-care issues that did not emerge until after hospital discharge (Altfeld et al., 2012). After hospital discharge, HF patients have issues with usual care including: breakdown in communication when transferring patient information from inpatient providers to those in the community (Lee, Yang, Hernandez, Steimle, 2016), poorly controlled chronic conditions due to the termination of home health services (Dey et al., 2011), insufficient HF education to adequately perform self-care (Boren et al., 2009), physical limitations, heavy symptom burdens, psychological stress (Mulligan et al., 2012), complex HF self-care regimens (Riegel & Dickson, 2016), insufficient caregiver support (Imes, Dougherty, Pyper, & Sullivan, 2011), difficulty coping with change (Graven, Grant, & Gordon, 2015), and poor medication adherence (Riegel & Dickson, 2016). A body of work by the Naylor team (2004) tested transitional care models with HF care across four healthcare systems and developed transitional care interventions (TCIs). These TCIs are a set of time-limited coordinated follow-up interventions designed to address posthospital discharge issues. Research indicates TCIs improve health outcomes as HF patients at increased risk for early readmissions transition across settings (Feltner et al., 2014; Vedel & Khanassov, 2015). Types of TCIs include clinic
follow-up, home visits, telephone follow-up, telecare only, telecare in combination with other types of follow-up, and HF education (Boren et al., 2009; Feltner et al., 2014; Stamp, Machado & Allen, 2014; Vedel & Khanassov, 2015).

Various models of TCIs have indicated benefits for HF patients. Many of these models incorporated a combination of interventions as a key feature. In clinical trials where there was no difference in response between the intervention and control group, interventions including clinic follow-up, HF education, telephone follow-up, and telecare only were found to be low intensity interventions (Feltner et al., 2014; Vedel & Khanassov, 2015). Studies using combinations of interventions including clinic follow-up, HF education, telephone follow-up, home visits, and telecare with other interventions were rated medium intensity when findings indicated mixed results between intervention and control groups (Feltner et al., 2014; Vedel & Khanassov, 2015). Across studies, high intensity interventions consistently indicated improved participant response in intervention groups compared to control groups using a combination of a variety of interventions (Damery et al., 2016; Feltner et al., 2014; Vedel & Khanassov, 2015). Thus, methods are needed to prescribe TCI interventions based on HF patients’ care needs.

Focusing on poor care transition coordination in discharged elders with mixed diagnoses, Coleman and colleagues (2006) developed CTM®-15 instrument which measures the patient’s perceptions of care transition effectiveness in preparing them for self-care. Their data indicated that older adults who had favorable perceptions of preparation to perform self-care had lower readmission rates compared to cohorts who perceived poor preparation for self-care. Generalizability to HF patients who are multi-ethnic, carry heavy symptom burdens, complex care regimens and receive poor care
transition coordination remains to be tested. Building on research studies that associated delayed readmission rates with participants’ perceived preparation for self-care, patients’ perceived preparation for self-care could be examined, and TCI interventions could be titrated by nurse dose effect focusing on HF patients most vulnerable for readmission. Therefore, the purpose of this study is to examine HF patients’ perceptions of their preparation to perform self-care during the most critical times; at hospital discharge to 60 days’ posthospital discharge.

**Study Purpose**

**Research Questions**

The study was designed to address the following research questions: Comparing the control and the APN intervention group, are there differences in:

Health outcomes:

1. Perceptions of preparation to perform self-care, social support and problem-solving style on posthospital discharge days 1, 7, 14, 21, 28, 42 and 56?

2. Adherence with routine healthcare follow-up visits, morbidity (i.e., urgent care visits, emergency department visits, rehospitalizations) and mortality at 8 weeks posthospital discharge?

3. Healthcare charges (i.e., urgent care visits, emergency department visits, rehospitalizations, and charges for APN follow up with the intervention group only)?

On enrollment, data were collected on individual characteristics (i.e., HF diagnosis duration, education, race/ethnicity, socio-economic status, gender, age, HF symptom severity, and health outcomes (perceptions of preparation to perform self-care, social support and problem solving). By telephone, on days 7, 14, 21, 28, 42 and 56
posthospital discharge, data on patient’s perceptions of preparation to perform self-care, social support and problem-solving style were collected as well as information about preventable healthcare usage (i.e., urgent care visits, emergency department visits, re-hospitalizations). For intervention group participants, APNs called weekly to assess HF symptoms and provide healthcare education regarding self-care. Intervention group participants also initiated calls to APNs to answer self-care questions on Monday to Friday 8:00 AM to 4:30 PM. The study examined patients’ perceptions of their preparation for self-care, social support, problem-solving style, and how these perceptions changed over time. Results of this study will provide healthcare professionals a better understanding of HF patients most critical timepoints of their perceptions of self-care from hospital discharge up to 60 days. A time highest in mortality and morbidity for these patients. These data are important to develop interventions for improved health outcomes for this high risk population. Study findings may also provide data that will inform health policy.

**Conceptual Framework**

The conceptual framework of Donabedian’s Structure/Process/Outcome (SPO) provides a theoretical rationale for linking variables. The SPO assesses healthcare quality by measuring outcome related differences in structure or process and relationships of structure and process (Hoenig et al., 2002). Good structure promotes good process and good process in turn promotes good outcome (Zinn & Mor, 1998).
Figure 1. Donadedian’s *SPO* Model

**Study Variables for the Framework**

In this study, structure is the hospital setting where adults diagnosed with HF are admitted for acute care. Process is usual care plus the addition of the intervention of follow-up telephone calls after hospital discharge by APNs. Outcomes are health outcomes (i.e., perceptions of preparation for self-care, social support, and problem-solving style), morbidity (i.e., urgent care visits, emergency department visits, re-hospitalizations), and preventable healthcare usage (i.e., urgent care visits, emergency department visits, re-hospitalizations and follow-up intervention). The study focuses on the process of care and the related outcomes from the process of care.
CHAPTER II.
REVIEW OF LITERATURE

Introduction

Heart failure (HF) is a growing public health concern and the leading cause of hospital admissions for older Americans (Dharmarajan et al., 2017). With an aging population and the rising cost of HF care, Americans face an unsustainably high economic burden using current healthcare delivery models (Heidenreich et al., 2013). High hospitalization rates account for nearly 80% of HF costs with over 20% of HF patients readmitted within the first 30 days following care transition when transferring from hospital to home (Dharmarajan et al., 2017). Healthcare delivery inadequacy is an important source of many issues following hospitalization among HF patients (Benjamin et al., 2019; Albert et al., 2015; Nash, Fabius, Skoufalos, Clarke & Horowitz, 2016). Their healthcare needs are unmet, abundant, and require varying amounts of vigilance beyond the scope of today’s health systems such as care coordination, and communication between multiple providers and facilities (Nash et al., 2016). Because of these issues, federal legislation has focused on practice models that reduce healthcare delivery inadequacies for HF patients. Under the Hospital Readmissions Reduction Program (HRRP) of the Patient Protection Affordable Care Act of 2010, the Centers for Medicare & Medicaid Services provided incentives for hospitals to reduce HF readmission rates by rejecting up to 3% of Medicare reimbursements for hospitals with high readmissions rates (Bradley et al., 2013). In early analysis of these data, the HRRP indicated reduced 30-day readmission rates. Angraal et al. (2018) used the Nationwide Readmissions Database (2010 - 2015) including 2,128,140 admissions of adults
diagnosed with HF and found readmission rates decreased from 23.6% in 2010 to 21.8% in 2015 in those covered by Medicare (risk-adjusted odds ratio [OR] for yearly change in readmission, 0.96; 95% CI, 0.96-0.98). Readmission rates also decreased from 26.4% to 24.1% in those covered by Medicaid (risk-adjusted OR, 0.96; 95% CI, 0.94-0.98). Those privately insured had similar results. However, while efforts to reduce HF patients’ 30-day readmissions have been successful across the country, with reduced readmission rates there has also been an increase in 30-day mortality by 1.3% (Goldgrab et al., 2018). Thus, higher posthospital discharge mortality rates may explain lower readmission rates and represent worst health outcomes for HF patients. Goldgrab et al. (2018) suggested the interventions that have shown to be most effective in improving HF patients’ health outcomes focus on the identification and removal of issues hindering benefits indicated from use of national guideline recommended regimens.

Heart Failure Population Profile by Age, Gender, Race/Ethnicity

In the U.S., HF is the most frequent cause of hospitalization for older adults with an age range between 70 to 75 years (SD = 15) (Ambrosy et al., 2014) (Chen et al., 2011; Ambrosy et al., 2014). Seventy-five percent of HF diagnoses were caused by heart attacks; hypertension and heart valve diseases accounted for the remainders. Ambrosy and colleagues (2014) reported that much of today’s research was contributed by hospitalized HF patients that participated in HF disease registries. Little is known about HF patients living in the community. Ambrosy et al. (2014) examined data from 299,872 patients from 12 HF registries. They reported that HF affects all ages; however, the majorities (78%) were over 60 years of age. Women have been historically underrepresented in HF clinical trials and women tended to have HF not due to heart
attack, instead HF was attributed to high blood pressure, or heart valve problems. However, outcomes were similar for both genders. Using HF hospitalization rates as an indicator, health outcomes data from 2000 to 2010 examined by Hall and colleagues (2012) indicated a significantly ($p < .05$) increased rate of hospitalization for HF patients younger than 65 and older than 85 years. There were no gender differences found. Elders diagnosed with HF had multiple other comorbidities including depressive symptoms, diabetes, and chronic obstructive pulmonary disease (Ambrosy et al., 2014; Gallagher et al., 2011).

**Functional Classification**

The American Heart Association adopted the New York Heart Association (NYHA) functional classification that was developed in the 1920s for professionals to estimate the severity or limitations of HF symptoms and to use as a life expectancy guide. The NYHA classification uses four sets (class I-IV) to represent the degree of symptomatic limitation manifesting as undue fatigue, palpitation, breathlessness, or angina chest pain (American Heart Association, 2017). NYHA Class I patients have no limitations or ordinary activity does not provoke symptoms and they have mortality risks similar to the general population. Class II patients have slight limitation of physical activity being comfortable at rest but ordinary physical activity aggravates symptoms that is associated a 1-year mortality rate of 5-10%. NYHA class III patients have marked limitation of physical activity; they are comfortable at rest but less than ordinary activity produces symptoms. There is a 1-year mortality rate of 10-15% associated with NYHA class III symptoms. Patients deemed to be NYHA class IV are most severely symptomatic, they are unable to perform any physical activity without discomfort with
symptoms present even at rest and undertaking any physical activity increases discomfort. There is an associated 1-year mortality of 30-40% with NYHA class IV symptoms (Reisfield & Wilson, 2005). However, research by Allen et al. (2008) suggest a substantial discordance in symptom severity and life expectancy between healthcare professionals and patients. Findings from their study with a diverse sample (N=122) of adults diagnosed with HF indicated participant perceptions underestimate symptom severity and overestimate longevity. Because differences in perceived survival could affect decision-making regarding interventions and end of life planning, the causes of these misperceptions warrant further study of HF patient perceptions (Allen et al., 2008).

**Differences in HF Incidence by Race and Ethnicity**

In the U.S., Blacks are 1.5 times more likely to develop HF than Whites (Benjamin et al., 2019). The highest risk of developing HF was indicated among Blacks, followed by Hispanics, Whites, and Chinese Americans (4.6, 3.5, 2.4, and 1.0 per 1000 person-years, respectively). Benjamin et al. (2019) suggested this higher incidence reflected differences in the prevalence of high blood pressure, diabetes, and socioeconomic disparity, noting that Blacks had the highest proportion of HF due to hypertension (75%). In a U.S. study using three HF registries with 264,621 participants, Ambrosy et al. (2014) reported that Black and Hispanic populations made up 20% and 7%, respectively, of HF patients in the registries. Results indicated that minority groups developed HF symptoms at younger ages with more comorbidities resulting in worse health outcomes. In another study with 55,097,390 Medicare beneficiaries, Chen et al. (2011) reported reduced hospitalization rates for HF patients except for Black men whose readmission rates remained high at 3,201 compared to 2,007 per 100,000 person-years.
Ambrosy and colleagues (2014) reported that non-English speaking patients were excluded from HF clinical trials and there is a scarcity of data with non-English speaking Americans. Despite these differences, research suggested similar care delivery for ethnic minority HF patients. Thomas and colleagues (2011) examined hospital readmission and inpatient mortality rates in a sample of Black and Hispanic participants diagnosed with HF ($N = 78,801$) to determine whether care provided differed for minorities when compared to non-minorities. Results indicated the prescribed care provided followed the guidelines recommended by Heart Failure Society of America (HFSA) for all ethnicities (HFSA, 2010). In addition, Black and Hispanic participants had a lower in-hospital mortality rate than Whites. Differences in HF prevalence and outcomes by race indicated that Blacks and Hispanics have a lower in hospital mortality rate than White patients owing to shorter length of hospital stays (Ambrosy et al., 2014; Husaini et al. 2016). Ambrosy et al. (2014) reported a strong correlation between shorter hospital length of stay and a lower inpatient mortality.

In summary, most HF patients have been 60 years or older. The prevalence and health outcomes of HF were similar by gender. However, there were important differences by race. People of minority ethnicities had higher rates of HF prevalence at younger ages, greater numbers of comorbidities, Black men have higher hospital readmission rates, and there is a scarcity of data with non-English speaking Americans.

**Care Transitions Issues**

Care transition issues such as gaps in care occur when transferring healthcare delivery from the hospital to the community (Kociol et al., 2012). In a study of 720 hospitalized elders (Altfeld et al., 2012), most of the participants (83.3%) reported care
transition issues, and of those, 73% experienced care transition issues after hospital discharge. The participants’ average age was 74.5 years, almost half were Whites (49.2%), and 45.6% were Blacks. Most were married (40.6%) while others were widowed (28.9%), single or divorced (30.6%). Gender was not reported. The participants were mainly urban dwelling (62.6%) and only a small percent received state-sponsored Medicaid insurance (1.8%). Their care transition issues were related to stress, healthcare access and utilization resulting in readmissions and mortality. Participants’ issues were believed to be caused by living alone, lacking social support and having previous frequent admissions. Results identified 13 categories of issues were encountered. The issues were adhering to diet or recognizing worsening symptoms (45.8%), caregiver burden (35%), coping issues (34.4%), home health service delays caused by provider limitations (25.6%), barriers obtaining community services (23.6%), issues with coordination between care providers (19.4%), difficulty understanding plan for follow-up care (16.7%), medication management (16.4%), communication with service and medical providers (14.7%), mental illness (10.8%), medication reconciliation (10.6%), transportation issues (10%), and inadequate social support (9.7%). These issues resulted in poor health outcomes much of which were preventable (e.g. increased stress, healthcare utilization, readmissions, and mortalities). Other researchers reported similar results examining care transitions with HF patients (Yancy et al., 2016; Albert et al., 2015; Au et al., 2012; Kociol et al., 2012).

A classic report by Forster, Murff, Peterson, Gandhi and Bates (2003) indicated that nearly 75% of transitional care issues were preventable including adverse drug events, procedure related injury, laboratory abnormalities, worsening symptoms, transient
and permanent injuries. Research suggests that optimal inpatient care coordination lessened issues associated with care transition and reduced readmission rates (Albert et al., 2015; Stamp, Machado & Allen, 2014). Evidence-based guidelines from regulatory and practice organizations American College of Cardiology (ACC), American Heart Association (AHA) and Heart Failure Society of America (HFSA) have outlined measures that should be addressed during inpatient stays (HFSA, 2010; Dedhia et al., 2009; Yancy et al., 2016). These hospital-based guidelines, among others, outline the timing and delivery of inpatient education, discharge and transitional care processes, and quality improvement procedures (Kociol et al., 2012). However, in a survey of 100 randomly selected hospitals participating in the American Heart Association 

Get With the Guidelines-Heart Failure Registry, Kociol and colleagues (2012) found only 20% of the facilities provided patient instructions for worsening symptom recognition as recommended by the guidelines. According to Kociol et al. (2012), 91% of all hospitals delivered care transition education on the day of discharge. As a result, many issues that impact HF patients stem from unmet healthcare needs when transitioning care delivery from hospitals to home.

**Continuity of Care Issues**

HF patients receive care in a variety of outpatient settings. Issues with continuity of care result from a breakdown in communication when transferring patient information from inpatient providers to those in the community. Lee and colleagues (2016) reported from two different meta-analyses of multiple small randomized studies that examined communication coordination after hospitalization of HF patients. Studies with integrated communication between inpatient and outpatient providers resulted in improved patient
outcomes compared to those with fragmented transfer of patient information (Lee et al., 2016). In a study conducted in a large integrated healthcare delivery system in California using a nested matched case-control design with 11,985 HF participants, they examined the type of provider, type of follow-up care (clinic or telephone calls) and the effects on a 30-day hospital readmission rate (Lee et al., 2016). One follow-up type was a 7-day posthospital discharge clinic visit provided by physicians of internal medicine, family medicine, or cardiology. The other follow-up was a 7-day posthospital discharge telephone call provided by nurses and/or pharmacists. Findings indicated patients had a lower odds ratio of readmission when follow-up was provided within 7 days of discharge (adjusted odds ratio \([OR] = 0.81; 95\% CI, 0.70-0.94\)), compared to patients with follow-up 8 to 30 days after hospital discharge (adjusted \(OR = 0.99; 95\% CI, 0.82-1.19\)). Patients had improved outcomes from earlier follow-up whether received in a clinic provided by physicians or telephone calls provided by non-physician providers (nurses and pharmacists). These findings were supported by previous research indicating improved HF patient outcomes when there is early follow-up care between providers and patients from inpatient to outpatient settings.

**Home Health Services**

HF patients receive home health services after hospitalization to prevent readmission and account for 75% of all home healthcare visits (Benjamin et al., 2019). These home health services include home-based skilled nursing, social worker counseling, physical, occupational, and speech therapy as well as home health aide services (Dey, Johnson, Pajerowski, Tanamor & Ward, 2011). However, these services are time limited. According to an analysis by the Center of Medicare and Medicaid
Services (CMS), in data collected from 2001 to 2008, HF was one of the major diagnoses with the highest rates of poorly controlled chronic condition due to the termination of home health services (Dey et al., 2011). A 30-day 50% risk of emergency and hospital use by home health service patients has remained unchanged despite receiving these services (Stamp, Machado & Allen, 2014).

Additional issues with home health services include the conversion to electronic health records (EHR) in the hospital setting. The majority of the healthcare systems have changed from paper-based records to EHR to meet the recommendations of CMS. Results of this change led to improvements with care coordination with hospital providers, diagnostic centers, and pharmacies amongst others. However, home health settings have little or no use of EHR, leaving home health providers relying on paper-based communication. Important information is lost from illegibility and misplaced paper (Press et al., 2015). Press and colleagues (2015) in retrospective study, examined communication issues in the EHR between physicians and home health nurses with HF Medicare beneficiaries (N = 5,698). The sample received home health care from Visiting Nurse Service of New York. Communication failure rate was operationalized as the proportion of communication attempts per episode of home care that failed to reach a physician. Participants had an average age of 81 years, 61% were female, more than half were White race (58%), and most (71%) had an annual income greater than $30,000. All participants received help (paid, informal support from persons living outside or within the home). Most of the nurses (N = 1,006) communicating in the EHR with the physicians were salaried (69%), and held a bachelor’s degree or higher (64%). Results indicated a 22% 30-day hospital readmission rate and an average of an 8%
communication failure rate per episode of home care in which communication attempts between nurses and physicians were unsuccessful. Fifty-five percent of the failed attempts did not outline a specific cause for the communication failure (e.g. physician not available) while the remaining 45% were due to specific problems with the nurse’s inability to contact the physician (e.g. office closed, no answer, line busy, and physician away). Further, for episodes in which communication failure rate was 50% or higher, the unadjusted readmission rate was 28%, higher than the average for the cohort. Participant variables associated with high communication failure rate included: lower annual income, Black race, and patients whose performance of activities of daily living was low. Study limitations included omissions of HF symptom severity and the retrospective study design inability to explicate the causes for the majority of failed communication attempts. However, these findings illustrate the issues in home health services failed communication between health care providers and their associated poor patient outcomes. The overall hospital readmission rate reported in this study was similar to the national hospital readmission rate (Bejamin, et al., 2019).

**Heart Failure Self-care Issues**

Self-care in HF is a naturalistic decision-making process used to maintain physiologic stability (regimen adherence), to perceive change in symptoms and to respond to symptoms when they occur (self-management) and differs from empirical processes in important ways (Riegel et al., 2016). Instead of considering objective information, in naturalistic decision-making, people base decisions on prior experiences related to their physical condition, environment and culture. Consequently, there is wide variability in the ways people make decisions about their HF self-care. In another contrast
to empirical deduction, naturalistic decision-making is situation specific, thus, an individual may behave differently in similar situations. Furthermore, Riegel and colleagues (2016) suggest that each process (regimen adherence, symptom perception, self-management) in naturalistic decision making includes autonomous and consultative elements where autonomous decisions can be made independently by the patient and others may require advice from providers.

**Self-care and Physical Condition**

Successful performance of HF self-care improves the quality of life, reduces costs related to emergency and hospital use, and reduces mortality rates (Vellone et al., 2020). However, HF patients are challenged with a large amount of self-care issues due to the complexity of care regimens, physical limitations, heavy symptom burdens, and psychological stress (Yancy et al., 2016). Radhakrishnan and colleagues (2014) used a panel of content experts and the Delphi method to identify 172 self-care recommendations outlined for HF patients to follow. They reported that on average, HF patients take approximately 10 different medications each day (Riegel & Dickson, 2016). According to current guidelines published by the American College of Cardiology (ACC), American Heart Association (AHA) and Heart Failure Society of America (HFSA) (Yancy et al., 2016), guideline directed medical therapy (GDMT) relies on simultaneous use of multiple medications (beta-blockers, angiotensin converting enzyme inhibitors, aldosterone antagonists, digitalis, diuretics, anti-arrhythmic and other vasoactive agents), daily adherence to varied dosing schedules, blood pressure and urine output monitoring, watching for and reporting side effects, restricting diets, monitoring weight and adjusting diuretic dose, managing symptoms of shortness of breath, fatigue and dizziness and
deciding when to seek emergent medical help. With such complex regimens, culture, beliefs, and ethnic customs substantially influence how patients understand their health, their health seeking behaviors and how they make decisions related to their health (self-care) (Agency for Healthcare Research and Quality, 2015).

Falk, Ekman, Anderson, Fu, and Granger (2013), in an integrative literature review of 23 qualitative and quantitative studies, published in English between 2001 and 2011, with a high-risk group (elders aged ≥ 75 years) investigated the self-reported experiences. Participants had poor health literacy about their condition. However, with increased health literacy, self-care performance did not increase. It was concluded that the many ways in which high risk populations cope with HF is determined by how they understand their illness, with the majority showing poor health literacy in relation to HF. It was recommended that person centered interventions such as motivational interviewing showed promising results to improve self-efficacy for high-risk groups. In another study, Chen et al. (2013) conducted a correlational longitudinal study (N = 51, age: 64.7± 13.0 years) with newly referred patients from three HF clinics. Most of the sample were not ethnic minorities, however 18% (n = 6) were Hispanics and Blacks. All participants completed assessments of health literacy, HF knowledge, self-efficacy, and adherence to self-care at baseline, 2, and 4 months. Repeated measures analysis of variance with Bonferroni-adjusted alpha levels indicated health literacy was associated with HF knowledge longitudinally but was not associated with self-efficacy and self-care adherence. However, it was reported that the minority participants had inadequate health literacy. For effective HF health literacy, the individual (i.e., culture, age, resources and
understanding) and their associated limitations needs to be considered when planning HF self-care.

**Frailty.** Uchmanowicz et al. (2015) examined hospital readmission vulnerabilities and frailty syndrome in elders (N = 110) diagnosed with HF. Frailty syndrome, a multi-dimensional state in which individuals’ experience of loss in one or more domains of human functioning (physical, psychological, social) increases the risk of adverse outcomes. In their study, frailty was measured by a version of the *Tilburg Frailty Indicator* questionnaire that measures sociodemographic characteristics, physical, psychological and social domains. Possible scores ranged from 0 to 15 and scores lower than 5 indicated little or no frailty while higher scores indicated increased frailty. HF self-care was measured by a version of the *European Heart Failure Self-care Behavior Scale* questionnaire with higher scores indicated worse self-care. The study included 110 mostly Polish (89%) participants diagnosed with HF with an average age of 66 years; most were male (54%), partnered (57%), had no comorbidities (89%) and had mild HF symptoms (53%). Findings indicated that frailty was associated with advancing age (p < .001), lower education (p < .005), longer duration of HF (p < .001), higher number of hospitalizations (p < .005), and greater severity of HF symptoms (p < .001). The study limitations included: the participants’ average age was 66 years which is younger than the average age of hospital admission in the U.S of 70 years; the majority had no comorbidities, had mild HF symptoms and the study was conducted outside the U.S. where healthcare practices may differ. However, these findings were supported by a meta-analysis conducted by Denfeld and colleagues (2017) that included 26 studies and 6,896 elders diagnosed with HF with average ages in years ranging from 53 to 81 and
most were older than 70. Ethnicities were not reported. Meta-analysis results indicated that the prevalence of frailty syndrome in HF was 44.5% (95% confidence interval [CI], 36.2%–52.8%; z = 10.54; p < 0.001). Furthermore, results indicated there were no significant relationships between participant age or HF symptom severity and the prevalence of frailty syndrome.

**Self-care and Environment**

Transitioning from hospital to home has been identified as a variable that increases risks for poor health outcomes including early hospital readmission, increased morbidity and death especially with high-risk populations (Albert et al., 2015). The risk is highest for hospital readmission within the first 7 to 30 days posthospital discharge (Yancy et al., 2016). Bueno and colleagues (2010) examined U.S. trends in an observational study with 6,955,461 hospitalizations averaging a little under a million (974,974) HF elders each year between 1993 and 2008. The majority were Whites (85%) and the remaining were Blacks and other ethnicities (15%). Results indicated patients admitted with HF had progressive reductions in hospital duration and inpatient mortality rates comparing hospitalizations over the 16-year study period. However, there was an increased post discharge 30-day mortality rate, increased 30-day hospital readmission rate, and increased use of skilled nursing facilities after discharge. Further, Blacks had an increased rate of hospitalization (10.6% to 11.5%) while White elders’ hospitalization decreased (85.2% to 84.2%) during the study period. While the percentages were small for both groups, the trend for the Blacks was poorer than the White participants.

Hospitalized patients perform a minimal amount of self-care. It has been suggested that
promoting self-care during the hospital stay is a key component of improving self-care performance after hospital discharge (Yancy et al., 2016).

**Self-care and Culture**

Culture is a central concept in anthropology, referring to characteristics and knowledge of a group of people encompassing social behaviors and norms, variables to which people assign importance and the rules they make about interacting with the world around them (American Anthropological Association, 2016). Condition, environment and culture have been suggested to be the three determinants of naturalistic decision making in performing HF self-care (Riegel et al., 2016). Of these, little is known about the influence of culture on HF self-care performance. In their examination of HF self-care, Riegel and colleagues (2016) defined culture as personal variables that impact decision making such as ethnicity, age-related or generational, health literacy, and socioeconomic status. Furthermore, behaviors performed in HF self-care were influenced by cultural values, either in agreement with or divergent from the prevailing culture and social norms. Patients may decide to participate in situations where self-care (i.e. dietary restriction, medication adherence) would be difficult, rather than disrupt cultural norms.

**Self-care and Baby Boomer Generation.** Americans with a primary diagnosis of HF have a mean age for hospital admission between 70 to 75 years ($SD = 15$) and the condition was the most frequent cause of hospitalization for this generation (Chen et al., 2011; Ambrosy et al., 2014). HF has had its most substantial impact on the generation of Baby Boomers, about 76 million Americans born between 1946 and 1964, a period of increased birth rates following the end of World War II (Gillon, 2004). In North America and Europe, Baby Boomers were associated with privilege, a generation benefitting from
widespread government subsidies in post-war housing and education. Gillon (2004) suggested that since 1940s, Baby Boomers were intensely studied and targeted by unrelenting marketing campaigns offering products and services for every area of life. It has been suggested that such attention led to the perception by Baby Boomers that they were special; they pursued lifestyles of upward social mobility unattainable by only few in previous generations (Gillon, 2004; Badley, Canizares, Perruccio, Jogg-Johnson and Gignac, 2015). Despite this optimism, health outcomes for Baby Boomers did not improve. A study by Badley et al. (2015) with adults born between 1935 and 1974 ($N = 8,570$) used multilevel growth models to estimate the age trajectory by birth period (1935-1944, 1945-1954, 1955-1964, and 1965-1974), accounting for time periods and incorporating the influence of changes in education, household income, smoking status, and body mass index (BMI) on self-reported health over time. About half of the sample was females (53%) and ethnicities were not described. Findings indicated that despite beliefs that Baby Boomers were healthier than previous generations, no evidence was found that the health of Baby Boomers was different from that of the previous or succeeding generations. The effects of increased education, higher income, and lower smoking rates on improving self-reported health were nearly counterbalanced by the adverse effect of increasing body mass index (BMI). A large BMI is not believed to be a direct cause of HF; however, it contributes to hypertension that is associated with HF. As heart disease grew to be the leading cause of death in the U.S., a substantial sector of healthcare marketing focused on the epidemic resulting from sedentary lifestyles, high calorie and high fat diets (Yancy et al., 2016). These developments ranged from pharmaceuticals and interventional technologies (i.e. surgical, radiological,
catheterization) to data storing. The marketing of multiple pharmaceuticals to control HF symptoms has contributed to the complexity and issues HF patients have performing self-care (Radhakrishnan et al., 2014). This background of targeted marketing provides a context to explain the proliferation and acceptability of complex healthcare regimens used in HF self-care. Comparative research is needed to identify best practice models and regimens that could individualize and improve health outcomes for the population of Baby Boomers.

**Black Baby Boomers.** The subset of Baby Boomers who were Black lived by Jim Crow laws, a state sponsored rigid pattern of racial segregation involving lynching, disenfranchisement, sharecropping, tenantry, unequal educational resources, terrorism, and convict leasing that denied them basic human rights (Graff, 2016). According to author Graff (2016), even though the Civil Rights Movement legally ended many Jim Crow laws, the generation of Black Baby Boomers continued with feelings of mistrust, displayed hypervigilance towards systematic exploitation and used social ills targeting Blacks such as mass incarceration as evidence of continued government sponsored mistreatment. Therefore, the generational response of mistrusting healthcare systems and displaying nonadherence to regimens could be a natural response influenced by the experience of Blacks from the Baby Boomer generation. Thus, some protective behaviors adopted as a means of insulating themselves, in the end, contributed to poor health outcomes when Black HF patients avoided seeking healthcare and were nonadherent to regimens. Findings from a study by Davidson et al., (2007) on culture and HF self-care indicated that while culture provides a contextual background for interpreting health-seeking behaviors, individual differences prevail. Therefore, studies are needed to
investigate methods to engage Blacks from the Baby Boomer generation to identify individual benefits from involvement with healthcare providers and adhering to HF regimens.

**Computer Age.** Widespread growth in technological advances and the computer age occurred alongside the aging of the Baby Boomer generation. Remote digitalized home monitoring offered substantial promise in helping Baby Boomers to collect and transmit data to their providers and optimize patient-centered care (Feltner et al., 2014; Vedel & Khanassov, 2015). Early research indicated technologies providing in-home HF monitoring may result in greater risk control, improve quality of life, improve the quality of patient-provider relationships, reduce hospital length of stay, and reduce mortality (Grace et al., 2017). However, studies also indicated technological acceptance and perceptions of usability among elders were low (Grace et al., 2017). In a qualitative study with older adults diagnosed with HF \((N = 26)\), Grace et al. (2017) examined elders’ experiences interacting with autonomous zero-effort monitoring of physiological parameters. Participants’ average age was 75 years, most were male (73%) and had no HF symptoms (73%) reflective of HF symptoms found in an office-based healthcare setting. Ethnicities or socioeconomic statuses were not reported. The study took place in a smart-home laboratory where technology-enhanced floor tile, mattress, blanket, chair and couch measured vital signs including body temperature, weight, blood pressure, heart rate, and respiratory rate autonomously. Interviews completed after participating in the study activities revealed five themes: (1) strong likes or dislikes of technology, (2) perceived benefits of autonomous health monitoring allowing providers to remotely
monitor their health parameters, (3) disadvantages of autonomous monitoring including unaffordability and questions about data ownership, (4) lack of perceived need for continuous health monitoring, and (5) preferences for autonomous monitoring. Thus, while elders favorably rated technologies that required zero-effort in monitoring their health data, concerns about affordability and data ownership might limit the use of these technologies. However, clinical trials with adults diagnosed with HF transitioning from hospital to home have examined the impact of technologies installed in homes that required user interaction to remotely transmit health data to providers with results indicating elders showed high adherence to use of these devices (Feltner et al., 2014; Vedel & Khanassov, 2015). In contrast to participants in the study using the smart-home laboratory, participants in studies that were transitioning from hospital to home had higher HF symptom burdens and might have felt more vulnerable to poor outcomes overriding concerns about data ownership. Also, posthospital discharge remote monitoring technologies would be paid by health insurance companies removing questions about affordability. Kim and Lee (2017) conducted a systematic review of 46 studies examining digital technology with participants diagnosed with chronic diseases including HF (20%). The authors (2017) reported that studies were limited by a lack of gerontological focus, a dominance of pre-experimental designs, a narrow research scope, and insufficient data about HF outcomes. They recommended that future research should focus on smart device-based programs using patient-generated data for advanced data mining techniques, build knowledge to validate patient decision support systems, and expand digital practice through innovative technologies.
Self-care and Race/ethnicity. Davidson and colleagues (2007) reported that there were little data published on the influence of ethnicity on HF self-care. In an exploratory study examining how culture influences HF self-care with overseas-born persons living in Australia, Davidson et al. (2007) used an integrative literature review, focus groups (n = 6) and individual interviews (n = 16). Study findings revealed seven common themes (1) culture provides a contextual background for interpreting health-seeking behaviors yet individual differences prevail, (2) family involvement is important in decision making and providing support, (3) communication can be challenging and nondisclosure is preferred in some situations, (4) migration, whether forced or voluntary, has a substantial impact on adjustment of lifestyle, and adjustment to illness, (5) respect and value of all health professionals, yet primacy of a general practitioner brokering the healthcare system, (6) importance of religious and cultural beliefs in the life experience, and (7) fear of cancer over heart disease. Because this study was conducted outside the U.S. where healthcare practices differ, applicability to the U.S. population may be limited, however, the themes described in this study highlight the need to examine how culture influences HF self-care among ethnic minority populations. In another study, a clinical trial with Canadians and Americans (N = 4,038) at risk for cardiovascular events, Lewis and colleagues (2015) compared outcomes (heart attack, stroke, HF symptoms, resuscitated sudden death and need for cardiac revascularization) between self-described Black race and Hispanic participants to others of White race. Most of the participants were White (66%) with Black (20%) and Hispanic (13%). The average age of the participants was 66 years and men outnumbered women in each ethnic group. Socioeconomic statuses were not reported. After adjusting for comorbid illnesses, during an average 2.4-year follow-
up, results indicated poorer outcomes among Black race and Hispanic participants despite having similar access to care and experiencing lower rates of cardiovascular events. The researchers suggested that results might have been affected by the difficulty to measure variables such as characteristics that encompass social behaviors and norms (cultural influences) including health literacy, stress, maladaptive coping mechanisms, lifestyle habits (nutritional and physical activity patterns), and mistrust in healthcare systems.

Dickson, McCarthy, Howe, Schipper, and Katz (2013) conducted a cross-sectional study to examine variables that influence HF self-care decision making with a sample of Blacks ($N = 30$). Three instruments were used: The Self-care of Heart Failure Index (SCHFI V 6.2) was used to measure self-care, the Multidimensional Scale of Perceived Social Support (MSPSS) measured social support and the Duke Activity Status Index (DASI) measured illness-related factor. Semi-structured interviews were used to gather participants’ descriptions about making HF self-care decisions. Their average age was 60 years, most were male (60%) and 67% were moderately symptomatic of HF. Socioeconomic status was not reported. The theme that emerged from the interviews indicated that self-care was influenced by cultural beliefs, including the meaning ascribed to HF. The development of HF was believed to be inevitable or attributed to stress and a HF diagnosis was less concerning than a diagnosis of cancer. Self-care and health outcomes were linked to spirituality (‘‘the doctor may order it, but I pray on it’’). Cultural beliefs were found to support medication adherence, however, difficulty reconciling cultural preferences (favorite foods) with the salt-restricted diet was also reported. Results from the questionnaires (self-care, social support and illness-related factor) indicated a significant relationship between social support and self-care ($r = 0.45,$
$p = .01$). These findings were supported by results of other studies (Graven et al., 2015; Davis et al., 2015). The authors suggested that research to develop and test culturally sensitive interventions are needed, and community-based interventions that provide culturally acceptable resources to facilitate self-care should be explored. The influence of participants’ socioeconomic status was not explored and is a limitation of this study.

**Caregivers and Social Support Issues**

The American Heart Association (Albert et al., 2015) examined studies conducted between 1990 and 2012. Results from these studies indicated that caregiver roles and outcomes in HF clinical trials need further examination as many were pilot studies that had small sample sizes and/or a narrow scope. Most studies described caregiver engagement as a proxy for participants who had impairments in providing self-care (Coleman et al., 2006; Altfeld et al., 2012; Naylor et al., 2004). However, results of other studies suggested that having adequate social support improved HF patients’ self-care performance (Graven & Grant, 2014; Gallagher, Luttik & Jaarsma, 2011; Salyer, Schubert & Chiaranai, 2012). Gallagher and colleagues (2011) conducted a cross sectional study of HF patients in the Netherlands ($N = 333$) during their second hospitalization. The *European Heart Failure Self-care Behavior Scale* was used to measure self-care behavior. A multiple component measure of social support was used to categorize patients into low, moderate, and high levels of social support according to the patients’ perceptions of support they received from their partners. Findings indicated patients with high levels of social support reported to be significantly ($p = .002$) more likely to consult with health professionals for weight gain, fluids consumed, adherence to medication regimens, immunizations and exercise compared to those with medium to low
levels of social support. The average age of the participants was 72 years, 66% were male, 56% were married or cohabitating, 29% were widowed, and 4% were divorced. Most of the participants (93%) had severe HF symptoms graded by the New York Heart Association functional classification I to IV, (class IV represents the most symptomatic and shortest life expectancy). Comorbidities reported were depressive symptoms (39%), diabetes (36%), and chronic obstructive pulmonary disease (34%). There were no differences ($\chi^2 = .27$) in support by gender of the patient.

A qualitative study by Imes et al. (2011) examined the caregiving experiences of 14 HF partners. Findings indicated that the severity of the condition limited the partners’ lifestyle resulting in feelings of social isolation, feelings of low support in making end-of-life decisions for the patient. Thus, with increased support, caregivers would be more participative in HF patients’ care. These findings were supported in another study by Hwang, Luttik, Dracup & Jaarsma, 2010. This study compared 338 spouses of HF patients to partners of healthy persons ($N = 1,202$). It was found that partners of HF patients provided more than customary spousal support. These data suggested providing resources for caregivers early during the HF patient’s hospitalization would increase the caregiving support given to the patient leading to improved health outcomes.

**Problem-solving Issues**

HF patients and caregivers have difficulty coping with change. According to Albert and colleagues (2015), HF patients who inadequately provided self-care, failed to recognize when symptom severity worsened, and they failed to act. Theorizing that coping resources such as social support and social problem-solving may influence HF self-care behaviors, Graven et al. (2015) examined the interaction of these variables in
determining HF self-care behavior. The *Stress and Coping* theoretical framework guided the study and describes how people psychologically adapt to stressful situations. Using a cross-sectional predictive design with a cohort of 201 HF clinic patients in North Florida, the researchers examined the effect of symptomology, social support, social problem-solving, demographic and clinical variables on HF self-care behaviors. Most of the sample (86.1%) were non-minority race; no other descriptors were reported. Almost half of the sample (40.3%) was aged between ages 65 to 74 years and 11% were older than 85. Most of the participants were male (62.7%), partnered (58.2%), college graduates (54.2%), and had mild or no HF symptoms (66.7%) reflective of HF symptoms found in an office-based healthcare setting. Nearly a third (32.8%) were low to middle income ($30,000 and $50,000). Two summative scales were used to measure social support; the *Interpersonal Support Evaluation List-12* measured perceived support (i.e., belonging, tangible, and appraisal support) and the *Graven and Grant Social Network Survey* measured breadth and satisfaction with social network. *The Social Problem-Solving Inventory Revised-Short*, a 25-item survey was used to measure social problem-solving orientation and problem-solving styles (e.g. rational, impulsivity/carelessness, and avoidance). The participants completed the *European Heart Failure Self-Care Behavior Scale* during doctor’s office visits. Scores indicated poor self-care behavior performance with an average score of 25.6 on a scale of 9 to 45; higher scores indicated more self-care behavior. An analysis of HF self-care scores by race was not reported. Participants that had higher self-care scores also reported having larger social networks, and tangible support. Using stepwise regression analyses, findings indicated a set of six variables that explained 19% of the variance in HF self-care behavior (race, symptom frequency,
symptom-related interference with enjoyment in life, HF symptom severity, rational problem-solving style, and social network). Graven and colleagues (2015) also indicated the findings aligned with existing research except for the contribution of race. In their analysis, minority race was the largest predictor explaining variances in self-care behavior scores. The investigators discussed contrasts with other studies that associated minority race with negative indicators of self-care, including low health literacy (Chaudhry et al., 2011), and decreased knowledge of HF (Davis et al., 2015). In contrast to previous research, in the study by Graven and colleagues (2015), minorities demonstrated rational problem-solving style as a coping resource that contributed to predicting higher HF self-care behavior performance scores. These findings indicating minorities had higher HF self-care scores might reflect the influence of higher education and low HF symptom burden of participants in the study; majorities of whom were college graduates (54.2%) and two-thirds (66.7%) had mild or no HF symptoms. These individual characteristics of minorities overshadowed their ethnicity and support results of a previous exploratory study that indicated culture provides a contextual background for interpreting health-seeking behaviors yet individual differences prevail (Davidson et al., 2007).

**Medication Issues**

Medication reconciliation issues have been associated with frequent hospitalization among HF patients contributing to poor health outcomes and high costs (Foust, Naylor, Bixby & Ratcliffe, 2012). According to The Joint Commission (2006), medication reconciliation is used as a tool to compare medications prescribed to those taken by the patient. The standard of reconciling medications at every transition of care
is to avoid errors of omission, duplication, dosing error or drug interactions. Picker and colleagues (2015) examined the number of discharge medications and patient outcomes with 5,507 patients discharged with chronic illnesses that included 24% HF patients. Results indicated that 20.8% were readmitted within 30-days of the hospital discharge, and the number of discharge medications was greater for patients having a 30-day readmission compared to those without a 30-day readmission. The findings indicated a significant ($p < .001$) association between increasing numbers of discharge medications and the prevalence of 30-day readmission. Using multiple logistic regression analysis, HF patients that had more than six discharge medications were found to be independently associated with a hospital readmission within 30 days. However, the findings indicated no significant differences between patients with or without 30-day readmission related to age (55.2 vs. 56.4 years), male gender (47.5% vs. 48.1%), Whites (45.6% vs. 49.7%), Blacks (47% vs. 44%), other race (7.4% vs. 6.3%) and median income ($30,037 vs. $29,281). These data suggested the greater number of discharge medications for HF patients was associated with increased 30-day hospital readmission rates.

**Medication Adherence**

Medication nonadherence is common among HF patients, highest among Blacks and has been associated with poor health outcomes (Riegel & Dickson, 2016; Picker et al., 2015; Granger et al., 2005; Horwitz et al., 1990; The Coronary Drug Project Research Group, 1980; Irvine et al., 1999). According to Riegel and Dickson (2016), approximately 40% to 60% of HF patients with medication insurance coverage had poor prescribed medication adherence with only 10% having high adherence. Other studies investigated medication adherence focusing on the interactions of variables such as self-
care expectations, the effect of medication counseling, HF knowledge about diet (low salt, fluid restriction) and lifestyle modifications (exercise, monitoring weight), recognizing and acting with worsening symptom severity (Albert et al., 2015). Multiple variables have a negative effect on HF medication adherence (e.g. advanced age, using multiple medications, and multi-morbidity) (Naylor et al., 2004; Saleh, Freire, Morris-Dickinson & Shannon, 2012; Coleman, Parry & Minn, 2006; White, Garbez, Carroll, Brinker & Howie-Esquivel, 2013).

**Variables influencing medication adherence**

Riegel and Dickson (2016) conducted a prospective study with 212 American adults (149 Whites; 63 Blacks) examining risks for medication nonadherence between these racial groups and how the variables differ. A significantly higher percentage of Black participants (63.5%) were single, divorced, separated, or widowed compared to Whites (31.5%) ($p = .001$); a significantly higher percentage of Blacks (36.5%) were low income compared to Whites (8.1%) ($p = 0.001$), and average years of education (14.5 years vs. 13 years) attained was significantly ($p = .001$) lower for Black participants. Medication adherence was measured using *The Medication Event Monitoring System*; a device attached to a bottle of medication to record the date and time of all bottle openings. Participants that had medicine bottle openings at the prescribed intervals more than 88% of the time were considered to have high adherence, while those with bottle openings lesser than 88% of the prescribed intervals were deemed non-adherent. The device was incorporated into the participants’ routines including those that used pillboxes. Findings indicated 90% of the participants reported poor medication adherence; many (60%) missed taking medications unintentionally due to forgetfulness.
and 27% reported intentionally skipping medication doses. Riegel and Dickson (2016) reported four interconnected adherence patterns: rarely non-adherent (22%), frequently non-adherent (51%), intentionally non-adherent (19%), and reformed non-adherent (8%). The researchers found that both intentional and unintentional nonadherence were based on modifiable patient characteristics. The participant’s perceived need for the HF medications influenced high adherence as well as poor adherence. For example, participants that noticed improved breathing with use of their diuretics found benefits in adhering to the medications. Conversely, patients whose providers failed to prescribe pre-admission medications on discharge perceived that taking the medications was not necessary. Background beliefs influenced adherence. When HF symptoms were thought to be trivial, negative attitudes regarding the importance of the medication regimen influenced poor adherence. Some described high adherence as loss of control. Participants described concerns about side effects of taking many medications that influenced poor adherence. Contextual issues including past experiences, views of others, self-efficacy, health literacy, socioeconomic status and satisfaction with care influenced adherence patterns. In this study (Riegel & Dickson, 2016), Black participants had significantly lower medication adherence compared to White participants (76.2% vs. 51.7%; \( p = .001 \)). With the Black participants, 16 variables were associated with nonadherence. Four of the variables jointly explained nonadherence: more comorbidities, lower serum sodium, higher systolic blood pressure, and use of fewer activities compensating for forgetfulness, while for White participants, older age was the only variable explaining the individual effects of nonadherence. These findings were consistent with results of other studies (Chaudhry et al., 2011; Davis et al., 2015). Thus,
compared to others, Black participants had higher rates of medication non-adherence and had more characteristics that negatively influenced decision-making capabilities. Other negative influences included not partnered, low income, and number of years of education. These differences suggest variations in HF self-care were less associated with non-modifiable culture (race/ethnicity) and were more associated with mitigatable socioeconomic variables. Thus, medication adherence patterns were modifiable, influenced by individual characteristics and were function of illness beliefs.

**Medication Cost.** The use of Guideline Directed Medical Therapy (GDMT) medications in clinical trials indicated substantial improvements in the rates of morbidity, mortality and hospitalization for HF patients (Yancy et al., 2016). However, these regimens consist of multiple medications that have been associated with high costs. In 2012, the estimated cost of medications used in GDMT was $750 to $1,626/person/year (Voigt et al., 2013). Further, Voigt and colleagues (2013) reported that these costs were often underestimated due to exclusion of the medications used to treat comorbidities within the syndrome of HF. Accounting for other medications used to treat HF syndrome, Voigt and colleagues (2013) computed an annual cost of $6.13 billion to $9.43 billion spent on medications alone. Banka and colleagues (2013) conducted a study to examine the cost-effectiveness of 3 classes of generic medications commonly used in GDMT for HF patients (angiotensin-converting enzyme inhibitor [ACEI], beta-blocker [BB], and aldosterone antagonist [AldA]). Cost-effectiveness was measured by the incremental cost-effectiveness ratio (ICER), determined by the difference in cost between two possible interventions, divided by the difference in their effect. In this study, effect was measured in quality adjusted life years (QALY), or the economic equivalent of a
year lived free of symptoms. Thus, ICER represented the average incremental cost associated with 1 QALY. The researchers used data from previous studies using a probability model (Markov) to extend the findings to the lifetime of the cohorts based on hospital readmission and death rates. The study compared participants treated with diuretics alone to 3 treatment arms: 1) ACEI therapy; 2) ACEI plus BB; and 3) ACEI plus BB plus AldA. They accounted for medication costs used during the hospitalization continuing to posthospital discharge. Results indicated that participants who used ACEI alone and ACEI plus BB had improved cost savings compared to those who used diuretics alone. The greatest gains were indicated when all 3 classes of medications were used with an ICER of less than $1,500/QALY gained. Despite these favorable health outcomes and cost savings, many HF patients receive little benefit from the use of GDMT medications. Riegel and Dickson (2016) found that approximately 40% to 60% of HF patients with medication insurance have poor prescribed medication adherence with only 10% having high adherence. In a classic double-blind randomized controlled trial (RCT) conducted by Granger and colleagues (2005) with 7,599 participants diagnosed with HF using a study medication versus placebo, it was reported participants with high adherence (study medication or placebo) were associated with a 35% lower mortality rate compared to those with poor adherence. Using the pill count method, participants that used medications as prescribed > 80% of the time were considered to have high adherence compared to those with medication use < 80% of the time. High adherence was associated with lower mortality in all participants (hazard ratio 0.65, 95% CI 0.57 – 0.75, p < 0.0001). Participants with high adherence to placebos had lower mortality rates than those with poor adherence to the study medication. Further, the
mortality rate was lower for placebo users with high adherence compared to placebo users with poor adherence (19% vs 24%). The researchers suggested that high adherence to medication use was associated with performance of self-care behaviors in general. Research indicates that multiple variables have a negative effect on HF medication adherence (e.g. advanced age, using multiple medications, female gender, tobacco use, high average heart rates at rest, and multiple comorbid conditions (White et al., 2013; Granger et al., 2015). Collectively, these findings suggest HF patients with poor medication adherence are likely to have worse outcomes in mortality and costs. Therefore, improvements in medication adherence could be associated with better self-care in general.

In summary, the issues of HF patients were fragmented healthcare delivery transitioning care from hospitals to the community, issues with complex HF regimens and self-care, low health literacy, caregiver issues and social support needs, difficulty coping with change, medication reconciliation and poor medication adherence. Studies indicated these HF patients’ issues (health literacy, symptomology, how they cope with change, social problem-solving, the number of prescribed medications and adherence) have negative effects on performance of self-care behaviors and recognizing and acting when symptom severity threatens. Integrated communication between inpatient and outpatient providers improves health outcomes in readmissions when follow-up care is provided within 7 days of hospital discharge. Among Blacks, research to develop and test culturally sensitive interventions are needed, and community-based interventions that provide culturally acceptable resources to facilitate self-care should be explored. There were very little data on HF patient ethnicity and social support.
Heart Failure Follow-up Interventions

Heart Failure Education

National guidelines recommend HF education to facilitate self-care, monitor and respond to symptoms, adhere to prescribed medication regimens, and maintain physical activities (Yancy et al., 2016). Boren and colleagues (2009) reported that HF education intervention programs incorporated 20 education topics in four groups: (1) knowledge and self-management (diagnosis and prognosis, mechanisms of how HF affects the body, aims of treatment, management and symptoms, medication review and discussion of side-effects, knowing when to access/call providers, communication with the physician, follow up for assessment or reinforcement); (2) social interaction and support (social interaction and support, stress, depression); (3) fluids management (salt/sodium restriction, fluid balance, daily measurement of weight, ankle circumference, self-monitoring and compliance relative to fluids); and (4) diet and activity (dietary assessment and instructions, physical activity and exercise, alcohol intake, smoking cessation). HF education interventions were most often provided verbally using teaching booklets, newsletters, cards with warning symptoms, workbooks, patient health records, written regimen guidelines, diaries, medication organizers, weight graphs, and audio/video aides (Boren et al., 2009). A common method of providing HF education is by teach-back. White and colleagues (2013) examined teach-back method where iteratively patients were asked in open-ended question format to repeat information provided. Teach-back method allows the provider to assess patient comprehension and provide reinforcements and is an effective method to provide HF education interventions.
Heart Failure Education Intervention

Researchers have examined the survival benefit of discharge education. Powell and colleagues (2010) conducted a single-center, multiple-hospital; partially blinded behavioral efficacy in a 3-year RCT with 902 participants who had mild to moderate HF symptoms. Participants had an average age of 63.6 years; were 47% women, 40% racial/ethnic minority, and 52% had annual family income less than $30,000. All participants received 18 contacts and 18 HF specific educational written materials. Participants randomized to the control group (n = 451) received HF specific education by mail and telephone calls to assess comprehension. In addition to written HF specific education material, participants randomized to the intervention group (n = 451) received 18 two-hour group-based HF specific education sessions with counseling to help develop mastery in problem-solving skills. Health professionals led group sessions; no titles were described. The rate of HF hospitalization or death in the intervention group was not different from the control group (163 [40.1%] vs 171 [41.2%], respectively, odds ratio, 0.95 [95% CI, 0.72-1.26]). Thus, Powell and colleagues (2010) found that an education only intervention or education plus self-management counseling did not reduce the rate of death or HF hospitalization in adults with mild to moderate HF symptoms. In another study, Jha, Orav and Epstein (2009) examined associations between two performance measures and rates of HF hospital readmission for 2,222 hospitals in the U.S. The first measure was discharge planning, operationalized as the adequacy of documentation in the chart that HF discharge education was provided; and the second measure was participant reported experiences with discharge planning. Jha and colleagues (2009) found a weak correlation in hospital performance between the two performance measures (r = 0.05, p <
Findings indicated no association between performance on discharge planning and readmission rates among participants (readmission rates among hospitals performing in the highest quartile vs. the lowest quartile, 23.7% vs. 23.5%; \( p = 0.54 \)) and only a very modest association between performance on the participant reported measure and readmission rates for HF (readmission rates among hospitals performing in the highest quartile vs. the lowest quartile, 22.4% vs. 24.7%; \( p<0.001 \)). Jha and colleagues (2009) suggested that efforts to collect and publicly report HF specific education in discharge planning were unlikely to yield large reductions in HF readmissions or mortality.

Overall, education intervention improved knowledge that is essential to perform self-care. However, education intervention studies indicated no improvements in hospital readmission or mortality rates, indicating that HF specific education is essential but insufficient to improve HF healthcare outcomes (Jha et al., 2009; Powell et al., 2010).

**Heart Failure Education Intervention Cost**

Determining the cost of HF educational interventions has been difficult due to the coupling of education with other interventions such as clinic visits, telephone follow-up, or home visits. In a RCT conducted by Peikes and colleagues (2009) including 15 hospital systems across the U.S. with fee-for service Medicare elders (\( N = 18,309 \)) diagnosed with HF and other comorbidities, the impact of hospitalizations, and monthly Medicare costs were examined in an education program provided for the intervention group by registered nurses, and licensed practical nurses in 1 program, delivered primarily by telephone follow-up. Control group participants received usual posthospital discharge care. The duration of the intervention varied widely within the 15 participating health systems starting at study enrollment and ranged from 18 to 38 months. Study data
were collected at 12 months. Peikes et al. (2009) reported the cost of the intervention was based on Medicare Part B benefits that covered outpatient services. Medicare paid a negotiated fixed fee ranging from $80 to $444 per participant per month, with an average of $235. Costs including those covered by Medicaid, private or supplemental insurance or beneficiary out-of-pocket payments were not included in the study data. Also, prescription drug expenditures were not covered by Medicare during the study period.

Findings indicated that 13 of the 15 programs showed no significant ($p < .05$) differences in hospitalizations. One hospital had 0.168 fewer hospitalizations per person per year (90% CI, −0.283 to −0.054; 17% less than the control group mean, $p = .02$) and a second hospital had 0.118 more hospitalizations per person per year (90% CI, 0.025 0.210;19% more than the control group mean, $p = .04$). None of the 15 hospitals generated net savings comparing costs of intervention groups to usual care participants. These findings were supported by the results of an RCT conducted by Agren and colleagues (2013). In their study, HF education intervention was provided at weeks 2, 6 and 12 posthospital discharge with data collection at 12 months after hospitalization. Findings indicated no cost improvements in QALY between dyads of HF patients and their partners in the intervention group that received nurse-led HF education delivered in-person during clinic and home visits and the control group dyads that received usual care by similar methods.

Overall, determining the cost impact of HF education interventions has been difficult due to the coupling of education with other interventions. Study findings have indicated that HF education provides knowledge essential to perform self-care. However, there were no observed cost benefits for HF education intervention participants compared
to others who received usual care measured by hospital readmission rates or QALY gained. Therefore, HF education alone is unlikely to lead to cost savings.

**Clinic Follow-up Interventions**

After hospital discharge, routine care for HF patients consists of a clinic follow-up intervention. There is minimal data reported about usual clinic follow-up interventions used in RCTs (Feltner et al., 2014; Vedel, & Khanassov, 2015). Most studies described usual care as that recommended by national HF guidelines at the time the studies were conducted (Albert et al., 2015). Starting in 1994, the Heart Failure Society of America (HFSA) consisting of researchers, physicians, nurses and other healthcare professionals has published literature-based recommendations for the care of HF patients (HFSA, 2010). In conjunction with other cardiology organizations, subsequent updates every 3-4 years have indicated: gradual escalating doses (up-titration) of medications (beta blockade, angiotensin converting enzyme [ACE] inhibitor, digitalis, aldosterone antagonists, diuretics, anti-arrhythmias and other vasoactive agents), surgical implantation of pacemaker-defibrillators to prevent sudden death, initiation of HF education, supportive care during hospitalization, and early posthospital discharge follow-up within 24-48 hours by telephone within 7-14 days by clinic or home visit intervention (Yancy et al. 2016). Donaho and colleagues (2015) reported most of posthospital follow-up clinic visits were provided by general medicine physicians with only a small amount (7%) of clinic follow-up visits provided by cardiologists. This reflects on the trend in which a hospitalist manages the care of HF patients in hospital settings, without expectations of a longitudinal care relationship after hospital discharge.
Three types of clinic follow-up have been examined in HF TCI studies: primary care physician, nurse-led, and HF disease management multidisciplinary team. The impact of interventions has been measured by rates of posthospital discharge HF readmission, hospitalization for any cause and mortality at 30-days, and at 3 to 6 months. The effectiveness of clinic follow-up interventions provided by primary care physicians could not be determined due to insufficient data; registered nurse-led clinic study results indicated no differences for intervention participants, while participants that received HF disease management clinic interventions using multidisciplinary teams and home visits were found to have better outcomes compared to participants that received usual care (Feltner et al., 2014).

**Clinic Follow-up Intervention Cost**

HF patients have been found to be among the highest recipients of outpatient services. In 2012, there were 1.8 billion physician clinic follow-up visits for patients with a primary HF diagnosis and an additional 257,000 patient visits to hospital-based clinics (Benjamin, et al., 2019). Examining outpatient healthcare spending patterns for HF patients during 2011, Pritchard et al. (2016) found the average annual direct cost per high use recipient was $43,104 vs $3,955 per patient for the entire population. Dunlay and colleagues (2011) reported that outpatient interventions accounted for a little over 20% of the overall HF direct costs. The highest proportion (13.5%) of outpatient HF costs were spent during clinic follow-up interventions and emergency visits providing evaluation, management and procedures (dialysis, facility fees, minor procedure, eye care, anesthesia). Other outpatient costs were smaller and were spent on: imaging (2.9%) (echocardiogram, computed tomography [CT] scan, magnetic resonance imaging, x-ray,
ultrasound), medical equipment costs (2.7%), and laboratory (2.6%) (Dunlay et al., 2011). HF patients have many issues accessing healthcare through clinic follow-up interventions including: breakdown in communication when transferring patient information from inpatient providers to those in the community (Lee et al., 2016), poorly controlled chronic condition due to the termination of home health services (Dey et al., 2011), insufficient HF education to adequately perform self-care (Boren et al., 2009), physical limitations, heavy symptom burdens, and psychological stress (Mulligan et al., 2012), complex HF self-care regimens with poor medication adherence (Riegel & Dickson, 2016), insufficient caregiver support (Imes et al., 2011), and difficulty coping with change (Graven, Grant, & Gordon, 2015). These findings point to the inadequacy of clinic follow-up interventions in meeting the needs of HF patients posthospital discharge. Furthermore, these unmet needs result in increased hospital readmission rates and costs for HF care delivery.

**Heart Failure Disease Management Clinic**

National HF guidelines recommend using a multidisciplinary team approach, such as a HF disease management clinic as a method for intensifying the impact of clinic follow-up interventions for HF patients (Yancy et al., 2016). Advanced practice nurses (APNs) or physician assistants (PAs), led multidisciplinary teams that included other professionals including pharmacists, dietitians, therapists and social workers (Donaho et al., 2015). Donaho and colleagues (2015) conducted a retrospective study to examine the 30-day rate of hospital readmission for any cause and transitional care problems participants encountered in a protocol-driven post-discharge HF intervention at the Herman Memorial Hospital at the Texas Medical Center. The sample included 169
participants referred by a physician and recently discharged from the hospital with a HF diagnosis. The HF management clinic protocol included: (1) physical examinations; (2) medication reconciliation; (3) medication up-titration; (4) individualized HF education emphasizing symptom recognition and reporting; (5) coordination of community health care resources; and (6) comprehensive health plans with medication lists and assistance in establishing follow-up with home health care and other providers. The duration of the intervention was 4 to 6 weeks’ posthospital discharge. Per protocol, 2 clinic visits provided by a multidisciplinary team were planned within week 1 and another clinic visit between weeks 4 and 6 posthospital discharge in which caregivers were encouraged to participate. A third interim visit was allotted by protocol for participants deemed to be at high risk for hospital readmission. A time allotment of 60 minutes was scheduled for initial visits and subsequent visits were planned for 40 minutes. Participants had an average age of 59 years, 48% male, 65.8% Black, 20.2% White and 10.5% Hispanic ethnicities. The majority (83%) had moderate to severe HF symptoms. The multidisciplinary team consisted of an APN specializing in HF and a pharmacist collaborating with a HF cardiologist. Physical examinations were performed by the APN and focused on volume assessment. Volume assessment included measuring orthostatic blood pressures in the supine, sitting, and standing positions; performing a bedside evaluation of jugular venous pressures; and looking for evidence of fluid retention. Weights recorded in the clinic were compared to those recorded at discharge and by the participants themselves at home. Examinations included a point-of-care laboratory evaluation to detect electrolyte abnormalities and any deterioration in kidney or liver function. The participant’s overall health status was evaluated to address comorbid
conditions. Based on the examination findings, the APN made prescribed regimen changes as necessary. Per the protocol, participants brought prescription and nonprescription medications to clinic visits for review. The pharmacist performed medication reconciliation focusing on correcting errors, assessing medication adherence, titrating HF regimen to maintain volume balance and maximize therapeutic benefits, and addressing contraindicated therapy. All participants were provided a user-friendly printed list of medications and dosing instructions in either full or wallet-size formats. Care coordination services included communications with the primary care provider, other specialist providers, and/or home health services. In coordination with the referring provider, the need for additional resources was evaluated, such as physician specialists, home health services, rehabilitation services, and palliative care or hospice services. Results indicated that 67% of the patients had at least 1 visit in the HF disease management clinic. Of those, 80% completed the 2-visit protocol. At the first visit, 25% of the patients were experiencing fluid retention and 13% were dehydrated. At the second visit, 20% were experiencing fluid retention and 13% were dehydrated. Medication reconciliation errors were common, with an average of 2.1 and 0.8 errors per person recorded at the first and second visits, respectively. Overall, 14 participants (12.3%) had a hospital readmission, a 44.3% reduction compared to a rate of 22.1% observed at 30-days for HF patients discharged from the study hospital during the same period. Of the participants readmitted, causes were due to acute HF decompensation (57.1%), gastrointestinal bleeding (21.4%), chronic obstructive lung disease (7.1%), coughing blood (7.1%), and pacemaker-related complications (7.1%). These findings were
supported by the results of other researchers (Ducharme, Doyon, White, Rouleau, & Brophy, 2005).

**Heart Failure Disease Management Clinic Cost**

A research team (Miller et al., 2009) examined health outcomes and costs comparing usual care to that provided by a HF disease management clinic, estimating the lifetime intervention impact. They conducted an 18-month RCT in Texas with HF patients ($N = 1,069$) that indicated HF disease management clinic interventions resulted in significant survival benefit ($p = .037$), with intervention patients living 76 days longer, and no cost savings. Miller et al. (2009) computed a lifetime direct cost per patient averaging $74,025 for the control group and $78,875 for the intervention group.

Participants had an average age of 70 years, 79% were males, 73% White, 21% Hispanic, most had little or no HF symptoms and 22% had moderate to severe HF symptoms. The monthly cost for each participant was reported to be $107.00; however, whether or not facility costs were included or the amount paid by insurers was not described. Miller et al. (2009) used a Markov model to extend the data from the RCT to the lifetime of the cohort considering symptom distribution and progression, observed mortality rates and direct costs. QALY gained was used to compute cost-effectiveness. Findings indicated that over the participants’ lifetimes, intervention participants experienced a lifespan extension of 51 days. The lifetime intervention cost was computed to be $4,850 higher in the intervention group than the control group; however, the intervention had a favorable long-term discounted cost-effectiveness of $43,650/QALY. These results suggest overall costs were higher in the HF management clinic group; however, the QALY gained was modestly beneficial.
Overall, annual direct cost per HF patient for clinic follow-up intervention was $43,104 compared to a cost of $3,955 per patient for the general population (Pritchard et al., 2009). Moreover, many issues have been associated with HF patients accessing usual care in clinic follow-up interventions resulting in high hospital readmission rates. With high costs associated with hospitalization, the focus has been to examine interventions that reduced hospital readmission rates. HF disease management clinics recommended by national HF guidelines used a multidisciplinary team approach to coordinate interventions needed by HF patients transitioning care delivery from hospital to home. The cost of care delivery by disease management clinics was computed at $110.00 per patient per visit in one study (Donaho et al. 2015) and a lifetime cost of $78,875 in another cohort (Miller et al., 2009). These studies have indicated that interventions provided in HF disease management clinics have successfully reduced hospital readmission rates. However, costs for intervention group participants in these studies have been higher than the costs of usual care recipients. Moreover, findings by Miller and colleagues (2009) examining the economic value of life lived by HF disease management clinic participants indicated there was a lifespan extension of 51 days at $43,650/QALY. Considering the rising prevalence of HF and its associated economic burden, whether the value provided by HF disease management clinics is acceptable to society remains to be explored. The duration of post-discharge follow-up interventions has not been recommended by national HF guidelines (Yancy et al., 2016). There is substantial variation in the timing and duration of clinic follow-up interventions posthospital discharge for HF patients (Donaho et al., 2015). In a meta-analysis of TCIs
studies, Vedel and Khanassov (2015), found that HF patients received clinic follow-up interventions 7 to 10 times over a 12 to 18-month period in the studies.

**Provider Roles**

It was reported that important considerations of intervention providers were the roles they performed, the caseload of patients and the hours of availability (Stamp et al, 2014). Provider roles have been found to include direct care provider, educator, guide, role model, and coach for self-care behaviors (Stamp et al., 2014). The impact of provider type in cardiology clinic settings was examined, comparing seven of the HF guideline-recommended interventions in a prospective study by Albert and colleagues (2010). The sample included 167 cardiology clinics and 15,381 HF patients. A third of the clinics did not include APN or physician assistant (PA) staff, 29% of the clinics included one APN or PA team member and the remaining 38% of the clinics had two or more APNs or PAs. Findings indicated that cardiology clinics with two or more APNs or PAs were significantly ($p < .01$) more likely to provide two of the HF guideline-recommended interventions (HF education and implantable pacemaker-defibrillator). Results indicated no differences between cardiology clinics staffed only by cardiologists and those that included APNs or PAs on the provision of the other five HF guideline-recommended interventions (cardiac resynchronization, beta-blockade, ACE inhibitors, angiotensin receptor blocker, and aldosterone antagonists). Taken together, results suggest interventions provided by an APN-led multidisciplinary team effectively improve health outcomes and interventions provided by APNs and PAs were equal or superior to that provided by physicians.
Home Visit Intervention

Brooten and colleagues (1986) developed and tested the first model of transitional care interventions (TCIs). In this classic model, home visit interventions were provided by APNs to low birth weight infants transferring from hospital to home and targeted lapses in management that contributed to early hospital readmission. Results of the clinical trials showed significantly improved participant outcomes and lower costs for intervention groups. The results of this study led to other numerous trials on a variety of high risk, high cost and high-volume patient groups including adults with HF (Brooten et al., 2002). Home visits have been commonly used and have been often combined with other interventions such as clinic follow-up, telephone follow-up, and telecare. Characteristics and forms of TCIs frequently overlapped when delivered by home visits. For example, where multidisciplinary teams delivered home visits, models included elements of self-care support and HF education.

Advanced Practice Nurse Direct Care Provider

In a landmark study with a sample of elders diagnosed with HF, Naylor and colleagues (2004) conducted an RCT examining the effects of APNs providing direct care in home visits and its impact on hospital readmission rates. This study used a 3-month protocol with participant data collection through 12 months’ posthospital discharge. With 3 APNs providing the interventions, there was an initial APN inpatient visit within 24 hours of hospitalization, followed by APN assessments at least daily during the hospitalization and a minimum of eight APN weekly home visits beginning within 24 hours of hospital discharge. Participants had an average age of 76 years, 43% were males, 64% White, and 36% Black. The severities of HF symptoms were not
reported. The control group \((n = 121)\) received usual care. The intervention consisted of APN home visits combined with telephone follow-up for the intervention group \((n = 118)\). Home visits were scheduled weekly during the first month after the hospitalization with one of these visits coinciding with the initial follow-up visit to the patient’s physician. In the second and third months, home visits were scheduled bimonthly and additional APN home visits were provided based on participants’ risks for early hospital readmission. For participants requiring hospital readmission, for any reason during the intervention period, the APN resumed daily hospital visits to facilitate the transition from hospital to home. However, the length of time devoted to the intervention for such participants did not extend beyond 3 months after the index hospital discharge. The length of time allotted for home visits was not reported. Home visits were a continuation of the care initiated during the inpatient stay including comprehensive discharge planning. Following hospital discharge, the same APNs that collaborated with physicians to coordinate inpatient services provided in-home patient assessments. Assessments focused on vital status evaluation, incorporating the participant and caregiver goals to guide the transition of their care from hospital to home. APNs were available by telephone for participant calls regarding questions or problems throughout the study period for 14 daytime hours on weekdays and 4 morning hours on weekends. Interventions provided a safety net to prevent medication and other medical errors and enabled communication of health information to providers at the community level. Home visits by the APNs identified signs of fluid retention, provided education interventions about using diuretics on an as-needed basis, collaborated with participants’ physicians, and implemented interventions to prevent acute HF decompensation.
Education interventions including applicable comorbidity counseling were audiotaped and tapes and recorders were left for participants and caregivers to review for all home visits. Participants, caregivers, physicians, and other providers were given summaries of goal progression, unresolved issues, and recommendations by the APNs. At 3-months, Naylor and colleagues (2004) found that the intervention group had a significantly lower rate of hospital readmission and death rate than the usual care group ($\chi^2 = 5.0, p = .026$; Cox regression incidence density ratio = 1.65, 95% CI 1.13 - 2.40). At 12 months, the intervention group participants had a significantly longer time to their first readmission, lower death rate ($\chi^2 =5.0, p = .026$; Cox regression incidence density ratio =1.65, 95% CI 1.13–2.40), and fewer readmissions (104 vs. 162, $p = .047$). These findings were supported by results of other studies (Brooten et al., 2002; McCauley, Bixby & Naylor, 2006; Stauffer et al., 2011).

**Advanced Practice Nurse Coaching Interventions**

Coleman and colleagues (2006) focused on APN-led home visit interventions that minimized the number of professional care providers posthospital discharge and targeted patient self-reliance through coaching. In an RCT, Coleman et al. (2006) used a 28-day intervention combining home visits with telephone follow-up to examine the effect of APN-led coaching on hospital readmission rates measured at 30-day, 90-day and 180-day timepoints with elders ($N = 750$) with a variety of diagnoses including HF (15%). The average age of the participants was 76 years; with almost half males (49.7%) of majority White race (88.6%). Nearly two thirds of the participants (59.5%) had self-reported good/excellent health statuses. The control group ($n = 371$) received usual care consisting of clinic follow-up with physician providers. The intervention group ($n = 379$)
received home visits and telephone follow-up by APNs. The APNs were transition coaches. The measure used by the APNs consisted of a 4-pillar conceptual plan that included: (1) assistance with medication self-management, (2) a patient-centered health record, owned and maintained by the participant with information needed to facilitate continuity of the care plan across settings, (3) timely follow-up with primary or specialty care, and (4) a list of red flags indicative of a worsening condition and instructions on how to respond. The APN availability during the study was not reported. Participants in the intervention group were provided two visits. An inpatient APN visit was used to establish rapport, introduce the patient-centered health record and arrange a home visit within 48 to 72 hours after hospital discharge. In the second, an APN home visit, the Medication Discrepancy Tool was used to review and reconcile medications (i.e. prehospitalization and posthospitalization medications, non-prescription medications, and medications prescribed to others that were used by the participant). The APN and participants discussed any identified medication issues. Participants and caregivers were encouraged to maintain and to continually update the personal health record and to share this document with their professional providers across healthcare settings. Home visits were also used to rehearse or role-play effective communication techniques so that participants had adequate preparation to articulate their needs. The APNs reviewed red flags or signs that indicated a worsening condition and provided education about the initial steps to take to manage the red flags and when to contact the appropriate health care professional. The home visit was followed by three telephone follow-up interventions in the 28 days’ posthospital discharge period. The first telephone follow-up intervention was used to determine whether the participant had received appropriate
services (e.g. whether new medications or durable medical equipment had been obtained). The focus of the two subsequent telephone follow-up interventions was to review the participant’s progress toward goals established during the home visit, discuss health visits with other healthcare professionals, reinforce the importance of maintaining and sharing the patient-centered health record, and support the participant’s role in self-care. Results indicated that intervention participants had lower hospital readmission rates at 30 days (8.3 vs. 11.9, \( p = .048 \)) and at 90 days (16.7 vs. 22.5, \( p = .04 \)) than the control group. Intervention participants had lower hospital readmission rates for the same condition that precipitated the index hospitalization at 90 days (5.3 vs. 9.8, \( p = .04 \)) and at 180 days (8.6 vs. 13.9, \( p = .046 \)) than control group participants. Intervention groups reported high levels of confidence in managing self-care. These findings suggest APNs providing coaching interventions by home visits combined with telephone follow-up effectively improved health outcomes with this majority White sample of participants that had mixed diagnoses and rated their health as good/excellent. Generalizability to multi-ethnic HF patients with heavy symptom burdens, complex care regimens and poor care transition coordination remains to be examined. These findings were supported by results of other studies (Blue et al., 2001; Harrison et al., 2002, Rich et al., 1995).

APNs in studies provided many integrated functions during home visits. An analysis of interaction logs created by APNs as providers during home visits in RCTs indicated APNs provided well-developed skills in assessing, teaching, counseling, communicating, collaborating, knowing health behaviors, negotiating systems, and having condition-specific knowledge (Brooten et al., 2003). Further, a dose of APN time and contact makes a difference in improving health outcomes and reducing healthcare
costs. Using the scope of nursing practice, providers: (1) assessed vital status, understanding of medications/discharge instructions/follow-up appointments, transportation issues, issues with acquiring medications, home healthcare agencies and caregiver burden; (2) coached patients in medication self-care, adhering to follow-up appointments, articulating needs to providers, recognizing signs and symptoms of acute HF decompensation red flags, and using a patient-centered health record to facilitate information transfer; (3) confirmed post-discharge plan and adjustments since discharge and issues that emerged since hospital discharge; (4) facilitated medical management as prescribed for HF and comorbid conditions, coordinated care and telephone follow-up interventions as needed; (5) discussed patient questions and issues related to transition to home; (6) documented in patient-centered health record in promoting interdisciplinary communication, on a discharge checklist focused on critical activities (e.g. medication reconciliation, patient education), and documented data coordination efforts and expectations; and (7) promoted patient self-activation and self-care. Findings in studies with APNs providing home visits indicated improved outcomes for intervention participants. However, in home visit studies with non-nurse providers, similar benefits among intervention participants were not found (Boult et al., 2013; Triller & Hamilton, 2007). This suggests APN interventions within the scope of nursing practice were effective in improving HF health outcomes following hospital discharge.

**Home Visit Intervention Cost**

Naylor and colleagues (2004) conducted an RCT with a sample of elders diagnosed with HF examining the effects of 3 APNs providing direct care to test the impact on costs, hospital readmission rates and quality of life self-reported using the
Minnesota Living with Heart Failure Questionnaire. The study used a 3-month protocol with participant data collection through 12 months posthospital discharge. Based on the 3-month detailed logs, intervention direct costs totaled $115,856 or $981.83 per participant, accounted for representative annual salaries for APNs and multidisciplinary experts’ time used to prepare and provide the intervention. The costs of medications (prescription and non-prescription), other supplies, and other facility fees and indirect costs were not included. Participants had an average age of 76 years, 43% males, 64% White and 36% Black. HF symptom severity was not reported. The control group (n = 121) received usual care consisting of outpatient services directed by their physicians. The intervention group (n = 118) received home visits combined with telephone follow-up. There was an initial APN inpatient visit within 24 hours of hospitalization, followed by APN assessments at least daily during the hospitalization and a minimum of 8 APN weekly home visits beginning within 24 hours of hospital discharge. During the first month after the hospitalization one home visit coincided with the initial follow-up visit to the participant’s physician. In the second and third months, home visits were scheduled bimonthly and additional APN home visits were provided based on participants’ risks for early hospital readmission. For participants requiring hospital readmission, for any reason during the intervention period, the APN resumed daily hospital visits to facilitate the transition from hospital to home. However, the length of time devoted to the intervention for such participants did not extend beyond 3 months after the index hospital discharge. The length of time allotted for home visits was not reported. During home visits, the APN assessment incorporated participant and caregiver goals to guide the transition of their care from hospital to home. The APNs identified signs of fluid
retention, provided education interventions about using diuretics on an as-needed basis, collaborated with participants’ physicians, and implemented interventions to prevent acute HF decompensation. Education interventions including applicable comorbidity counseling were audiotaped and recordings were left for participants and caregivers to review for all home visits. Participants, caregivers, physicians, and other providers were given summaries of goal progression, unresolved issues, and recommendations by the APNs. The APNs were also available by telephone for participant-initiated calls regarding questions or problems throughout the study period for 14 daytime hours on weekdays and 4 morning hours on weekends. At 3-months, findings indicated the intervention group had a significantly lower rate of hospital readmission and death than the usual care group (log rank $\chi^2 = 5.0, p = 0.026$; Cox regression incidence density ratio $= 1.65, 95\% CI 1.13 - 2.40$) that persisted at 12 months with the intervention group participants having a significantly longer time to their first readmission, lower death rate ($log\ rank\ \chi^2 =5.0, \ p=.026$; Cox regression incidence density ratio $=1.65, 95\% CI =1.13–2.40$), and fewer readmissions ($104$ vs. $162, p =.047$). Results indicated higher direct costs for the intervention group ($$115,856$ vs $64,531$) resulting from the number of APN home visits relative to control group ($13.2$ vs $6.3$ visits), and from higher APN salaries and involvement of multidisciplinary HF experts. These higher costs were offset by cost savings from reductions in usual care home visits ($$16,465$ vs $22,533$), acute care visits to physicians or the emergency department ($$6,329$ vs $10,819$), and hospitalizations ($$587,253$ vs $1,065,927$). The net result was a $37.6\%$ reduction in total costs over the 12-month study period ($$725,903$ vs $1,163,810, p < .002$; $6,152$ vs $9,618$ per participant). Thus, although findings were limited by omitting indirect costs, this reduced
hospitalization rate resulted in lower average costs and significant cost savings for the intervention participants compared to the control group ($7,636 vs. $12,481, p = .002). For intervention patients, short-term improvement was found in quality of life at 12 weeks (p < .05); at 12 months the difference was not significant. Similar cost savings were reported in other studies (Coleman et al., 2006; Leff et al., 2009; Stauffer et al., 2011). Relatedly, home visit interventions were also effective in reducing costs by providing palliative care for participants diagnosed with severe refractory HF symptoms (Wong et al. (2013).

Overall, findings in studies examining the impact of home visits on hospitalization and costs have indicated improved outcomes for intervention participants. Cost savings were due to decreased hospitalization use. In addition, short-term improvements in quality of life were indicated among participants with lower hospitalization rates.

**Telephone Follow-up Intervention**

National HF guidelines recommend an initial telephone follow-up be provided within 48 to 72 hours after discharge to focus on medication reconciliation, medication adherence, appointment attendance and hospital readmission risks (Yancy et al., 2016). However, it was found that this intervention varied widely across studies in purpose, timing, frequency and duration (Feltner et al., 2014). Posthospital discharge telephone follow-up interventions included elements of 3 purposes. In some studies telephone follow-ups were used for data collection (Misky et al., 2010); in others, patient-initiated hotlines were used to answer post-discharge questions (Dunagan et al., 2004); and studies that used provider-initiated calls were common (Coleman et al., 2006; Dunagan et al.,
2004; Naylor et al., 2004). Provider-initiated follow-up calls were used especially when participants were unlikely to initiate calls themselves and served for data collection (Feltner et al., 2014). Provider-initiated telephone follow-up interventions are often paired with other interventions such as HF education, home visits and telecare. Using an RCT, Dunagan and colleagues (2004) examined the impact of telephone follow-up interventions on time to hospital readmission, mortality, functional status, and satisfaction with adults diagnosed with symptomatic HF (N = 151) posthospital discharge. Participants had an average age of 69 years, 44% were males, 56.5% were Black, and the majority (83%) had moderate to severe HF symptoms. Participants were randomized to usual care as prescribed by their primary care physicians or to the intervention group that received scheduled telephone follow-up calls by specially trained nurses promoting self-care as prescribed by cardiologists. The nurses’ credentials were not reported. Twenty (26.3%) intervention group participants also received 1 or more home visits, and 18 participants (23.7%) were provided bathroom scales. The basis for determining home visit recipients was not reported. Nurses also assessed participants for HF exacerbations for which they advised using supplemental diuretics or contacted the physician for instructions. The intervention duration was 2 weeks. Intervention participants received a telephone follow-up within 3 days after hospital discharge and then at least weekly. Call frequency was adjusted based on the nurses’ assessments of clinical status and self-care abilities. Intervention participants could also initiate calls to ask questions or clarification. Findings indicated intervention participants had a non-significant longer time to hospitalization (hazard ratio [HR] = 0.67; 95% CI 0.47–0.96; p = .029), hospital readmission (HR = 0.67; CI 0.46–0.99; p = .045), and HF–specific
readmission ($HR = 0.62; CI 0.38–1.03; p = .063). The intervention was also found to have had little effect on functional status, mortality, and satisfaction with care. These findings were supported by results of other studies (Altfeld et al., 2012; Debusk et al., 2004; Riegel, Carlson, Glaser & Romero, 2006). Thus, telephone follow-up interventions are commonly used to provide TCIs. However, study results have failed to indicate improvements in important health outcomes such as hospital readmission rates.

**Telephone Follow-up Intervention Cost**

Hebert and colleagues (2008) conducted an RCT with adults posthospital discharge diagnosed with HF ($N = 406$) to examine hospital readmission rates, quality of life measured by the *Health Utilities Index Mark 3* and *EuroQol-5D*, and costs measured by the ICER. The study was conducted in 4 urban hospitals in the Harlem, New York. It was a nurse-led posthospital discharge intervention delivered as 1 face-to-face nurse inpatient visit followed by regular telephone follow-up interventions over a 12-month period. Control group participants received usual posthospital discharge follow-up care. The average age of the participants was 59 years; the majority was male (54%) with ethnicities of 46% non-Hispanic Black, 33% Hispanic, and 15% non-Hispanic White. Nearly three quarters (72%) of the participants had high school completion or less and only 26% had greater than high school education. Per participant, the cost of the intervention was $2,177 accounting for nurse time ($1,506) and physician and other investigator time ($232) that were the largest cost components. Costs were reported in 2001-dollar value and included direct medical costs of: inpatient care, nursing home stay, clinic follow-up, emergency department use, prescription and non-prescription medicines, home visits by physicians, nurses and home health aides, medical equipment,
physician telephone calls, procedures or laboratory collections. Indirect costs included expenses for: transportation by patients/caregivers, housekeeper and patient time spent in medical care. At 12 months, the research team found that intervention group participants had fewer hospitalizations compared to the usual group (143 vs. 180; adjusted difference, -0.13 hospitalization/person-year [95% CI, -0.25 to -0.001 hospitalization/person-year]). Results indicated there were no differences in costs to payers per participant between the intervention and control groups ($17,838 vs. $17,680, p = 0.79). When direct costs were combined with indirect costs to reflect societal costs, there also was no difference per participant between groups ($22,888 vs. $22,134, p = 0.73). Cost and quality of life measures were higher in the intervention group than the usual care group. The ICERs over 12 months were $17,543 per EuroQol-5/QALY and $15,169 per Health Utilities Index Mark 3/QALY (in 2001 U.S. dollars). It was reported that from a payer perspective, the ICER ranged from $3,673 to $4,495 per QALY. The researchers applied national prices in place of New York City prices and found a societal ICER of $13,460 to $15,556 per QALY. Based on cost-effectiveness acceptability curves, Hebert et al. (2008) suggested the intervention was most likely to be cost-effective for patients with mild or no HF symptoms. The study was conducted in an ethnically diverse, urban neighborhood; thus, results may not be generalizable to other communities. However, these findings were supported by the results of another study conducted by Mejhert and colleagues (2013) that indicated HF patients with poor quality of life had higher healthcare costs. Overall, these data suggest symptomatic HF patients incur higher costs and providing telephone follow-up to improve quality of life increases expenses.
Telecare Interventions

Vedel and Khanassov (2015) refer to telecare as a technology-based intervention that remotely transfers health information, such as electrocardiogram, pulse rate, respiratory rate, oxygen saturation, blood pressure, and body weight by digital cable without prearranged direct contact with providers. Feltner et al. (2014) reported technologies used in telecare studies included digital, broadband, satellite, wireless, or Bluetooth transfer to a monitoring center, with or without remote clinical visits (e.g., video monitoring). The intervention, alternatively called telemonitoring, telehomecare and telehealth by other investigators (Bowles et al., 2011; Dar et al., 2009) requires installing monitoring equipment in the homes. Since the 1990s, national HF guidelines recommended daily monitoring of vital signs including body weight indicative of volume status as the cornerstone of self-care for HF patients (Yancy et al., 2016). Goldberg et al. (2003) suggested these recommendations inspired disease management programs focused on self-monitoring and self-reporting of weight and symptom changes to personnel-intensive monitoring centers. Goldberg and colleagues (2003) found that HF patients experienced issues with self-monitoring such as missing data and self-reporting inconsistencies. Telecare interventions were designed to facilitate patient self-monitoring and self-reporting (Dar et al., 2009). Reviews of early studies examining telecare interventions compared to patient self-reporting indicated mixed results (Goldberg et al., 2003). In some studies, no difference was found in HF health outcomes for intervention groups receiving telecare interventions, while in other studies, hospitalization rates increased for intervention groups (Goldberg et al., 2003). Theorizing that telecare increased healthcare access for HF patients, subsequent telecare studies focused on
minimizing selection biases and selecting samples representative of HF populations (Goldberg et al., 2003; Dar et al., 2009; Bowles et al., 2011).

**Telecare: Weight, Blood Pressure and Oxygen Saturation**

An RCT conducted in England by Dar and colleagues (2009) with 182 elders posthospital discharge with a HF diagnosis examined the impact of telecare monitoring (weight, blood pressure, oxygen saturation) on days alive and out of the hospital at 6 months, number and duration of HF hospital readmissions, clinic visits, and quality of life. Participants had an average age of 71 years, 66.5% were males, 18.5% were of South Asian ethnicity, and 44.5% were newly diagnosed with HF. All study participants received care provided by HF nurse specialists. The credentials of the nurses were not reported. The control group \((n = 91)\) received home visits by HF nurse specialists that included HF education, and clinic follow-up interventions at the discretion of their primary care and cardiology providers. Cardiology clinic follow-up visits included a HF nurse specialist providing telephone hotline support Monday to Friday. Participants randomized to the intervention group \((n = 91)\) received usual care plus installation of the telecare equipment and information about operating the system. Through a control box, the equipment was connected to a conventional telephone line. Each morning, participants followed the verbal instructions from the monitor to measure their body weight, blood pressure, heart rate, and oxygen saturation. Participants responded to 4 questions related to symptoms indicative of acute HF decompensation (breathlessness, orthopnea, dizziness, ankle swelling) by pressing buttons marked ‘yes’ or ‘no’. All health information was encrypted and then transferred by the telephone line to the monitoring centers located in the study hospitals. A HF nurse reviewed the health
information daily (Monday to Friday). Variations in the health information from predefined parameters triggered an alert suggesting clinical deterioration and resulted in a telephone call initiated by the HF nurse for further assessment. This then led to one of 4 possible nursing interventions: life-style advice, medication advice, recommendation to contact primary care to refer for hospitalization, or recommendation to schedule an early appointment with the cardiologist. The caseload of the control group’s nurse was not described and the number of nurses providing care to the intervention group was not reported. Findings indicated the average length of time between study enrollment and equipment installation was 4 days, in which time 3 participants in the intervention group and 1 in the control group died. Study enrollment was terminated after 13 months due to funding arrangements. There was a high adherence to use of telecare with 90% of the intervention group using the monitoring as expected ≥ 95% of the time. Findings indicated telecare alerts and subsequent nurse telephone assessment identified clinical deterioration in the majority (64%) of the intervention group. Of those, nearly half (43%) were provided recommendations regarding diuretic therapy, 29% received reinforcement of self-care education (including medication reminders), 19% were advised to seek urgent/emergency treatments, and 8% led to recommendations to contact primary care providers. Comparing the intervention group to the usual care group, no differences were found in the median number of days’ participants were alive and out of the hospital (p = .30). Also, the length of stay was similar for both groups (p = .99). Similar findings resulted from other studies (Goldberg et al., 2003; Pekmezaris et al., 2012). These findings suggest telecare interventions were not superior to usual care.
Telecare: Weight, Blood Pressure and Oxygen Saturation Cost

In the study by Dar et al. (2006), the average length of time between study enrollment and equipment installation was 4 days, in which time 3 participants in the intervention group and 1 in the control group died. Study enrollment was terminated after 13 months due to funding arrangements. It was found that at 6 months, there was a higher mean National Health System cost for telecare participants equivalent to $9,220 (SD $14,754) compared to $6,012 (SD $7,694) for those in the control group ($p = .20$), indicating a difference that was not significant. Although the study was conducted outside the U.S. where healthcare practices may differ, with samples of American elders, similar findings resulted from other studies (Goldberg et al., 2003; Pekmezaris et al., 2012). Despite high adherence to telecare use by the participants, these data suggest telecare interventions were not superior to usual care and may lead to increased costs.

Telecare with Primary Care Clinic and Telephone Follow-up

In RCTs telecare was often combined with prearranged direct contact with HF patients such as by clinic follow-up, home visit and video calls, or telephone follow-up interventions. Cleland et al. (2005) conducted an RCT with adults diagnosed with HF posthospital discharge ($N = 426$) examining telecare compared to clinic follow-up and telephone follow-up interventions. The trial examined days lost to death or hospitalization during the 8 months of the study. Participants had an average age of 67 years; the majority were male (78%), partnered (73%) and less than half (39%) had moderate or severe HF symptoms. Ethnicities were not reported. The study compared a usual care group ($n = 85$) receiving clinic follow-up by primary care physicians, to an intervention group receiving monthly telephone follow-up calls by a HF specialist nurse
and to another intervention group \((n = 168)\) receiving clinic follow-up with a primary care physician, monthly telephone follow-up by a HF specialist nurse plus telecare interventions. The credentials of the HF nurse specialist were not reported. A service engineer installed the telecare equipment in the telecare intervention group’s homes at a median of 12 days and upper quartile 24 days following randomization. The equipment included a short-range radio transmitter connected to a conventional telephone line, web server and the internet. Encrypted health information included a single lead electrocardiogram using wrist band electrodes, blood pressure monitor, heart rate monitor, and an electronic body weight scale. The participants were asked to transfer health information twice daily, after emptying their bladders, before eating breakfast and evening meal and before taking the next dose of medications while wearing light clothing and without shoes. In addition to the monthly telephone follow-up by HF specialist nurses, when health information measurements fell outside of preset ranges for each parameter, alerts were triggered for the HF specialist nurses at the monitoring center to provide telephone follow-up interventions. Also, intervention group participants could contact the HF specialist nurse by telephone at any time. Telephone follow-up interventions were triaged based on the HF specialist nurse’s assessment. The method of providing medication adjustments by the HF nurse specialists was not described. During the 8 months of follow-up, it was found that 19.5%, 15.9%, and 12.7% of days were lost to death or hospitalization, respectively by the usual care, telephone follow-up and telecare groups indicating no significant differences. The number of hospital readmissions and mortality rates were similar among participants who received telephone follow-up or telecare, however the average duration of hospital admissions was reduced.
by 6 days (95% CI 1 to 11) with telecare participants; the statistical significance was not reported. The usual care group had a higher one-year mortality rate (45%) than participants who received telephone follow-up interventions (27%) or telecare (29%) ($p = .032$). The study findings had important limitations including: little or no information reported about the providers that participated in this study. The caseload of the HF specialist nurses was not reported nor was the HF training provided. In many studies, it was not reported whether nurses providing interventions were home care or transitional care trained, and the breadth and depth of HF specialty training were also not described (Albert et al., 2015). Moreover, data from studies conducted with registered nurses providing home care indicated that knowledge of HF self-care principles tended to be poor, limiting impart of HF education (Albert et al., 2002; Fowler, 2012; Mahramus et al., 2013). In the study by Cleland et al. (2005), the telecare equipment was installed at a median of 12 days and upper quartile 24 days following randomization delaying initiation of transitional care interventions. According to HF guideline recommendations, following hospital discharge, telephone follow-up provided within 24 hours and clinic or home visits provided in 7 to 14 days are most effective in improving outcomes (Yancy et al., 2016). These limitations potentially may have adversely affected the study results.

**Telecare with Home Visit and Telephone Follow-up**

Kulshreshtha and colleagues (2010) conducted an RCT with 150 non-homebound HF patients’ posthospital discharge to examine the effect of telecare combined with telephone follow-up and home visits on hospital readmission rates in a 6-month period. Adults eligible for participation had current hospitalization or hospital discharge within the previous 2 weeks from Massachusetts General Hospital with a primary diagnosis of
HF, history of hospital readmissions for cardiac-related reasons or ejection fraction ≤ 20%, non-homebound, non-candidates for cardiac or renal transplant, and had agreement from a hospital-affiliated physician. Almost half of the eligible participants (48%) offered telecare did not participate due to theirs or their physicians’ refusal. Participants had an average age of 67.5 years, males accounted for 63%, and 87% were White. HF symptom severity was not described. Participants used an average of 11 medications and most had comorbidities (i.e. 68.9% hypertension, 44.5% diabetes, and 14.8% depression). Usual care provided for participants randomized to the control group (n = 68) was not reported. Participants randomized to the telecare intervention group (n = 82) received 2 home visits by nurses. The nurses’ educational background was not described. The first visit was used to provide a health assessment and teach participants how to use the telecare equipment. The second visit occurred 1 week later to reinforce use of the telecare equipment. The time between hospital discharge and the start of telecare interventions was not reported. Using telephone to internet telecare equipment, the intervention group participants were asked to daily transfer to the monitoring center their health information including weight, blood pressure, pulse, and oxygen saturation. The intervention group also answered a set of symptom related questions including changes in breathlessness or swelling. The monitoring center was staffed by an APN with experience in management of cardiac patients. Weekly telephone follow-up interventions were provided by the APN. The content of the prearranged weekly telephone follow-up interventions was not reported. Daily transferred health information measurements that fell outside of preset ranges for each parameter triggered an alert for the APN at the monitoring center to provide telephone follow-up interventions. During these unplanned APN telephone
follow-up interventions, according to the study protocol, patients were recommended to increase diuretic doses (if a physician’s order was in place), or the physician or cardiologist was notified to make a referral for emergency care or continued monitoring. Participants in the telecare intervention group had a lower per person readmission rate ($M = 0.64, SD \pm 0.87$) compared to the usual care group ($M = 0.73, SD \pm 1.51; p = .75$), however the results were not significant. Several limitations of the study were identified. It was reported that the study’s sample size ($N = 150$) was not powered to evaluate for differences in clinical endpoints. It was unclear which aspect of the intervention led to the results: home visits by nurses, weekly telephone follow-up by the APN, or daily transfer of health information and the actions triggered by the alerts. Similar findings were reported by Gorodeski, Chlad and Vilensky (2013). In studies where providers did not make therapeutic decisions in real time and had delays waiting for other prescribing providers, results failed to indicate improved outcomes for intervention participants (Gorodeski et al., 2013).

**Telecare: Home Visit and Telephone Follow-up Cost.** Although intervention cost data were not reported in this study (Kulshreshtha et al., 2010), the researchers hypothesized that the intervention would result in cost savings by reducing hospital readmission rates, however there were no differences between intervention and control groups.

**Telecare and Continuous Participant Access to Providers**

Telecare combined with continuous access to healthcare providers was examined in an RCT by Giordano and colleagues (2009). The purpose of the study was to determine whether a telecare intervention for HF patients decreased hospital readmissions...
in comparison with the usual care group over a 12-month period. Eligible study participants were patients hospitalized with a diagnosis of HF confirmed by echocardiogram with an ejection fraction \(\leq 40\%\) and at least one hospitalization for acute HF in the previous year. Participants had to be clinically stable using an optimized oral regimen of maximally tolerated doses of both an angiotensin renin inhibitor and beta-blocker without requirement for intravenous diuretic therapy for at least 7 days, and no weight change \(\geq 2\) pounds for 5 days. The sample included a total of 460 participants with an average age of 57 years with majority (78%) older than 65 years; 85% were male, and 40.5% had moderate to severe HF symptoms. Ethnicities were not reported. All participants received HF education prior to hospital discharge including daily self-monitoring of body weight, blood pressure; adhering to dietary restrictions of sodium and fluids, instructions of when to undergo blood collection, and how to recognize and report acute HF decompensation symptoms. Those randomized to the usual care group \((n = 230)\) received clinic follow-up visits with their primary care physicians within 2 weeks of hospital discharge and clinic follow-up with their cardiologist within 12 months.

Participants randomized to the telecare intervention group \((n = 230)\) received a portable device that transferred a single lead electrocardiogram by a conventional or mobile telephone line. The equipment transferred the health information to a monitoring center that was staffed by a physician or nurse continuously 24 hours/day for 7 days/week. The nurses’ educational background or the physicians’ specialties were not reported. All telephone calls were patient-initiated and automatically linked to the patient by a stored telephone number and were recorded by a computerized call center. Telephone calls were of 2 types. The first type was a prearranged weekly call for patients with severe HF
symptoms, or every 15 days for patients with moderate HF symptoms. The second type of patient-initiated call was unplanned, where participants who experienced systolic blood pressure < 90 mmHg, weight gain of ≥ 4.5 pounds per day, or any doubt about the HF self-care regimen called for assistance. All calls led to one of several nursing actions. By the study protocol, the nurse compared the electrocardiogram to that obtained at enrollment and determined whether to increase beta blocker doses as prescribed by the physician; and used a standardized interview format to assess adherence to dietary and medication regimens, and reinforced HF education. Based on the nurse’s assessment, patients with stable vital statuses could be recommended to collect additional health information (symptoms, weight, and blood pressure), or schedule a new patient-initiated call, or schedule a clinic follow-up visit with a cardiologist. Participants with changes in electrocardiogram or signs of acute HF decompensation, the nurse consulted the cardiologist or primary physician who then made decisions about emergency care or hospitalization referral. During the 12-month follow-up, 55 patients (24%) in the telecare intervention group and 83 patients (36%) in the usual care group had at least one readmission (risk ratio = 0.56; 95% CI: 0.38–0.82; p=0.01). The telecare group had a significantly lower risk of readmission compared with the usual care group (hazard ratio = 0.50, 95% CI: 0.34–0.73; p=0.01). The intervention was associated with a 36% decrease in the total number of hospital readmissions (telecare group: 91 readmissions; usual care group: 142 readmissions). The rate of HF-related hospital readmission was 19% (43 patients) in the telecare group and 32% (73 patients) in usual care group (RR=0.49, 95% [CI]: 0.31–0.76; p=0.0001). No significant difference was found in cardiovascular mortality between groups. The duration of this study was 12 months.
The optimal duration of transitional care interventions has been contested among researchers. Vedel and Khanassov (2015) found that the duration of telecare intervention in studies ranged from 6 months to 12 months and suggested that studies using longer follow-up durations had higher effectiveness and resulted in improved HF health outcomes. However, Feltner and colleagues (2014) suggested that events far beyond 6 months posthospital discharge more reflect the natural course of HF progression than the effectiveness of transitional care interventions.

**Telecare: Continuous Participant Access to Providers Cost.** In this study, Giordano and colleagues (2009) examined costs associated with telecare with participants having continuous access to providers. When the Euro (€) was valued U.S. $1.46 (X-rates, 2017), the intervention cost was equivalent to $0.95 daily per participant with a mean annual cost per participant equivalent to $270.10 SD $56.94. It was not reported whether indirect costs and salaries of the professionals were computed. Findings indicated the mean cost for hospital readmission was significantly lower in the intervention group ($1,230 SD $2,530) than for usual care participants $1,895 SD $3,390), (−35%, p <.001). Analysis indicated the annual cost to prevent one hospital readmission was equivalent to $933 (95% [CI]: 850–1913). Reporting of indirect costs and salaries of the professionals would provide data to evaluate the value of the intervention.

**Telecare with Nurse Visit, Video Nurse Visit and Telephone Follow-up**

Bowles and colleagues (2011) examined telecare combined with telephone follow-up and video visits provided by registered nurses substituting for 45% of home visits in an RCT with 217 posthospital discharge HF patients. Primary endpoints
included 30-day hospital readmission. Outcomes were measured at 30, 60, 120, and 180
days. Eligible participants were English speaking adults 55 years or older posthospital
discharge for HF with skilled home nursing care services. A stratified random sample
according to the length of time since HF diagnosis: less than two months versus more
than or equal two months. The sample had average age of 72 years, 34% were males,
32% were Whites and 64% were of Blacks. Sixty-nine percent had self-reported poor to
fair health status. Twenty-eight registered nurses received training and provided care for
the participants. The training sessions included HF education, applying a clinical
pathway for HF, installing and operating the telecare equipment, teaching participants
how to use the equipment, and details about the study protocol. All participants received
HF education according to a HF clinical pathway used by the home health agency
provided by the same group of nurses. The control group participants (n = 116) received
10 registered nurse home visits. Participants randomized to the telecare intervention
group (n = 101) received video nurse visits gradually replacing face-to-face home visits
by the following schedule: week 1 – 2 face-to-face home visits, week 2 – 1 face-to-face
home visit and 1 video nurse visit, week 3 – 1 face-to-face home visit and 1 video nurse
visit, week 4 – 2 video nurse visits, and week 5 – 2 video nurse visits. Within the first
week of skilled home nursing care, intervention group participants (n = 101) received the
telecare equipment that included a video telephone, blood pressure monitor, and a body
weight scale. Participants’ health information was transferred via telephone to the
internet. Intervention participants were asked to use the telecare equipment daily by 11
AM. Four telecare nurses provided daily monitoring of transferred health information and
provided the video nurse visits. The telecare nurses notified the home visit nurse and/or
participant via telephone phone or voicemail if health information measurements fell outside of preset ranges to confirm the accuracy of the measurements with another reading (i.e. blood pressure) or assess for other symptoms (i.e. breathlessness). Bowles and colleagues (2011) found hospital readmission at 30 days (16% vs 19%, $p = 0.546$) and over 6 months (46% vs 52%, and $p = 0.363$) were lower in the telecare group, however not significant, indicating that the video nurse visits may be effectively substituted for home visits. The sample was largely comprised of Blacks (64%) and females (66%) which based on previous studies, Bowles et al. (2011) suggested is a higher risk cohort than other populations.

Overall, studies with telecare interventions have indicated mixed results. In some trials, outcomes were similar for telecare intervention and usual care participants. Gorodeski et al. (2013) suggested that employment of providers such as APNs that make therapeutic decisions in real time and avoid delays of waiting for other prescribers was a key element in affecting positive outcomes.

**Telecare: Nurse Visit, Video Nurse Visit and Telephone Follow-up Cost.** In this study (Bowles et al., 2011), even though telecare interventions did not significantly improve hospitalization rates, results indicating that video nurse visits effectively replaced face-to-face home visits promises remarkable cost savings. The researchers computed that replacing 45% of home visits with video nurse visits resulted in $700 saved per participant.

Overall, studies with telecare interventions have indicated mixed results. In some trials, outcomes were similar for telecare intervention and usual care participants with higher costs for intervention participants. In other studies, while telecare intervention
groups had reduced hospital rates, effectiveness of the intervention required access to providers that make clinical decisions in real time. In a study conducted in Italy by Giordano and colleagues (2009), telecare interventions costed €638, the equivalent of $931 to avoid a hospital admission costing the equivalent of $1,895 over the course of 1 year. Moreover, telecare interventions resulted in higher costs for intervention groups without indicating similar mortality benefits.

**Heart Failure Follow-up Intervention Effectiveness**

Researchers have rated transitional care interventions (TCIs) effectiveness, also known as intensity, by their impact on patient outcomes measured using: (1) 30-day hospital readmission rate, (2) hospitalization for any cause, (3) mortality rate and (4) emergency department use rate (Feltner et al., 2014; Vedel & Khanassov, 2015). Examining the intensity of TCIs provided for HF patients, Vedel and Khanassov (2015) used Review Manager 5.3 (The Nordic Cochrane Centre, The Cochrane Collaboration) to examine differences between TCIs groups and control groups in rates of hospital readmission and emergency department visits at the last provided follow-up time. Subgroup analyses were conducted to examine the effects on the risks of hospital readmission attributable to intensity of TCIs, severity of HF, and mean age of the participants. Relative risks and their 95% confidence intervals were determined to estimate mean effect sizes. The clinical effectiveness of the TCIs was determined by number needed to treat - number of persons who need to receive the intervention for 1 person to benefit - where a number of 1 represents the most efficacious intervention. A stratified analysis on the interaction between intervention intensity and duration was also conducted. The stratification was on a 6-level categorical variable: low intensity and 6
months or shorter; moderate intensity and 6 months or shorter; high intensity and 6 months or shorter; low intensity and longer than 6 months; moderate intensity and longer than 6 months; and high intensity and longer than 6 months. Based on these analyses, interventions rated low intensity included clinic follow-up (primary care physician or registered nurse-led), telephone follow-up, telecare only and HF education. Low intensity interventions indicated no improvements in participant response regardless of durations. Studies that used combinations of interventions including telephone follow-up, home visits, telecare with other interventions and HF education were rated medium or high intensity based on intervention participant’s response in reduced rates of HF hospital readmission, hospitalization for any cause and mortality (Vedel, & Khanassov, 2015). Six was reported as the number needed to treat or 6 was the average number of participants that needed to receive high intensity interventions to prevent an additional hospital readmission, or death (Feltner et al., 2014). High intensity interventions were found to improve outcomes with duration of 6 months or less. Moreover, Feltner and colleagues (2014) suggested that events far beyond 6 months posthospital discharge more reflect the natural course of HF progression than the impact of TCIs.

Key elements of trials using high intensity interventions included (1) inpatient assessment, patient education and discharge planning by APNs specializing in HF, pharmacist, nutritionist and case manager starting early in the hospital course; (2) telephone follow-up within 48 hours of discharge to assess if medications were obtained and if outpatient follow-up appointments were established; (3) outpatient case management for 30 days; (4) cardiology appointment with a HF specialist within 1 week of discharge and subsequent cardiology follow-up for at least 1 month; and (5) primary
care appointment scheduled according to the urgency of non-cardiac problems. Home visit frequencies varied between and within studies, most often beginning weekly following discharge then tapering to bimonthly, and lasted days to several months in some studies (Boult et al., 2013; Naylor et al., 2004).

In HF clinical studies, posthospital discharge TCIs duration ranged from 30 days to 32 months (Boult et al., 2013). The optimal duration of TCIs has been contested among researchers. It was suggested that studies using longer follow-up durations had higher effectiveness. However, Feltner and colleagues (2014) suggested that events far beyond 6 months posthospital discharge more reflect the natural course of HF progression than the effectiveness of the TCIs. Furthermore, findings of a meta-analysis indicated that low intensity TCIs failed to improve rates of hospitalization and emergency visits by HF patients regardless of duration of the interventions (Feltner et al. 2014). High intensity home visits provided within 24 hours after discharge reduced hospital readmissions; for every sixth invention participant, one participant would avoid hospitalization. A duration of 6 months or less of providing high intensity interventions is required to achieve reduced readmission risks (Feltner et al., 2014).

Donaho and colleagues (2015) found that usual care for HF patients following hospital discharge was most often provided by a general medicine physician. In HF posthospital discharge RCTs, various professionals have been employed as intervention providers. Albert et al. (2015) found that HF TCI studies most often employed nurses of varying educational backgrounds as providers. However, in studies that used a multidisciplinary approach, in addition to nurses, provider credentials included HF cardiology specialist, general cardiologist, family physician or general practitioner, physician assistant,
pharmacist, social worker, physical therapist, case manager and dietitian (Donaho et al., 2015). Important considerations of the intervention provider in TCIs studies include the roles performed, the caseload of patients and the hours of availability (Albert et al., 2010). Provider roles in TCIs studies have included care provider, educator, guide, role model, and coach for self-care behaviors. One of the earliest tested transitional care models examined the role of an APN as provider (Brooten et al., 1986). In these RCTs, APNs provided interventions including collaboration with medical teams to provide medical management, home visits and telephone follow-up interventions. Results from the APN-led studies indicated delayed readmission rates (Brooten et al., 2002; Naylor et al., 1994; Naylor et al., 2004; McCauley et al., 2006; Stauffer et al., 2011). Using a model that required fewer APNs to provide coaching interventions based on participants’ perceptions of preparation for hospital discharge, studies conducted by Coleman and colleagues (2006) indicated that intervention groups were nearly half less likely (8.3 vs. 11.9, \( p=0.048 \)) to be readmitted compared to others, benefits were sustained up to 180 days after discharge, and intervention groups reported high levels of confidence in managing self-care. In the Coleman study (2006), the intervention consisted of coaching participants by telephone follow-up and home visits to help patients navigate appointments, and to obtain and take medicines. However, samples consisted of primarily White elders with a variety of diagnoses of which HF comprised a small amount (15%) and who had self-reported good/excellent health statuses. Similar results could not be replicated when these coaching interventions were provided for a sample of hospitalized elders \( (N=720) \) by masters prepared social workers (Altfeld et al., 2012). In the RCT by Altfeld and colleagues (2012), findings indicated no differences between groups on
hospital readmission, or patient and caregiver stress. Similarly, in a study by Triller and Hamilton (2007) with HF patients receiving skilled home nurse visits compared to the intervention group that received home nursing visits plus a pharmacist’s care at 3 weeks’ posthospital discharge, there were no differences between groups by mortality \((p = .67)\) or hospital readmission \((p = .63)\). In another RCT, primary care physician-led interventions were examined in a healthcare system in a northeastern U.S. healthcare system (Boult et al., 2013). Interventions planned by primary care physicians and delivered by nurses failed to indicate improvements in the elders’ functional health (Boult et al., 2013). Across studies, it was found that results of TCIs studies with non-nurse providers have failed to indicate improved health outcomes (Albert et al., 2015). It has been suggested that key components of TCIs effectiveness were the involvement of providers such as APNs who can make therapeutic decisions in real time and avoid the delay of waiting for other prescribing providers (Gorodeski et al., 2013). A dose of APN time and contact makes a difference in improving health outcomes and reducing healthcare costs (Brooten et al., 2003).

Blacks and females have been suggested to be a higher risk cohort compared to other populations (Bowles et al., 2011). With a sample comprised of 64% Blacks and females representing 66%, a combination of telecare, home visits and video visits indicated no significant difference in outcomes between the intervention and control group participants (Bowles et al., 2011). Based on previous research indicating that Blacks and females contributed to higher risks for early hospital readmission, Bowles and colleagues (2011) attributed the lack of intervention group’s response to high intensity TCIs to these variables. However, the RCT conducted by Bowles and colleagues (2011)
used video nurse visits to gradually substitute for 45% of the face-to-face home visits with findings that indicated similar outcomes whether HF patients received home visits in person or by video. These results suggest the video nurse visits may be effectively substituted for home visits. APN coaching interventions provided by telephone follow-up and home visits indicated improved outcomes for intervention group participants (Coleman et al., 2006). However, generalizability to HF patients who are multi-ethnic, carry heavy symptom burdens, have complex care regimens and receive poor care transition coordination remains to be examined. Research is needed to pair interventions with patients according to their risks for early hospital readmission.

**Socioeconomic Influence on Heart Failure Patients**

In HF healthcare delivery, examinations of socioeconomic status (SES) often reveal inequalities between various SES levels in access to resources and low SES adversely impact outcomes (Díaz-Toro, Verdejo, & Castro, 2015). Foraker et al. (2011) conducted a study ($N=1,342$) in mid-western and northeastern U.S. to examine HF hospitalization rates of individual SES with state-funded healthcare for the poor (Medicaid) and community SES determined by annual neighborhood median household income. The study also examined the relationship between demographic and comorbid variables. The majority were White (67%) and the remainder were Blacks (33%). Most were male (55%) and with an average age of 67 years. One-fifth (20.1%) of the participants were Medicaid recipients and 41% lived in low SES neighborhoods. The median household was income of $16,519. Results indicated that while controlling for race, gender, age at HF diagnosis, body mass index, hypertension, education attainment,
alcohol use and smoking, participants with a high burden of comorbidity who were living in low SES communities, had an elevated risk of hospital admission (hazard ratio [HR] 1.40, 95% CI 1.10 – 1.77), death (HR 1.36, 95% CI 1.02 – 1.80), and hospital admission or death (HR 1.36, 95% CI 1.08 – 1.70), as well as increased rates of hospitalizations, compared to those with a high burden of comorbidity living in high SES areas. Medicaid recipients with a low level of comorbidity had an increased hazard of hospital admission (HR 1.19, 95% CI 1.05–1.36) and hospital admission or death (HR 1.21, 95% CI 1.07–1.37), and a higher rate of hospital readmission compared to non-Medicaid recipients. Thus, SES is an important contributor to poor health outcomes of individuals with and without HF symptoms. These data suggest that having a low SES (low neighborhood median household income or Medicaid recipient), regardless of other variables, including minority race/ethnicity, was associated with poor outcomes in higher rates of hospitalization and death. These results were consistent with other studies indicating that regardless of race/ethnicity, HF hospital admission rates increased with lower SES (Verma et al., 2017; Eapen et al., 2015) and participants diagnosed with HF that reported having larger tangible support also had better HF self-care scores (Graven et al., 2015). In another study, by Verma et al. (2017) with adults diagnosed with HF (N = 2,331) examined SES by comparing cohorts by partner status, levels of education and income and employment to determine the relationship of these variables to clinical outcomes of functional capacity and quality of life. Participants had a median age of 50 years (range 50 – 66), were mostly male (71.9%) and the majority were White (61.4%) with 32% Blacks and 3.8% others. Significantly higher percentages of Whites compared to Blacks were partnered than unpartnered (70.2% vs. 50.8%; p < .05), attained education beyond
high school versus a level of high school or less (65.7% vs. 56.4%; p < .05), and had annual income more than $25,000 (71% vs. 51.1%; p < .05); however, there were no differences whether employed or unemployed (65% vs. 60.8%, p > .05). Among these cohorts - grouped by partner status, levels of education and income and employment - Black participants compared to Whites had significantly higher percentages of those unpartnered than partnered (45.7% vs. 24%; p < .05), education attainment of high school or less versus a level beyond high school (39.2% vs. 28.4%; p < .05), annual income less than $25,000 than higher (43.2% vs. 24.1%; p < .05), and similar to Whites there were no differences in percentages by Black employment status (33.9% vs. 29.8; p > .05). Although there were no significant differences in employment statuses within race, the percentage of Whites employed (65%) exceeded the percentage of Blacks employed (33.9%) by almost double. Results indicated that those who were partnered, had education beyond high school, an income greater than $25,000, and were employed had better clinical outcomes in functional capacity and quality of life (Verma et al., 2017). Overall, these data suggest that compared to minority race/ethnicity, low SES was the more important variable associated with unsuccessful HF self-care performance and poor health outcomes. A plausible explanation is that adequate performance of HF self-care requires tangible and intangible resources that may be scarce among individuals with low SES.

**Housing Impact on Heart Failure Outcomes**

Unstable housing conditions create a considerable challenge for health maintenance. Yet Zuluaga et al. (2011) found a scarcity of studies in developed countries
that investigated the effect of housing on HF health outcomes. There are few studies conducted in the U.S. that examined this relationship. In a prospective study, Zuluaga and colleagues (2011) examined whether housing conditions predicted mortality in 433 elders diagnosed with HF in 4 hospitals in Spain. Participants were mostly women (56%) with an average age of 77 years. Ethnicities were not reported. Study variables of interest were whether homes lacked an elevator, running hot water, heating, indoor bathroom facilities, individual bedroom, washing machine, telephone and whether they often felt cold. The study accounted for possible confounders including alcohol consumption, smoking, physical inactivity, comorbidity, HF symptom severity, and HF cause (heart attack, hypertensive, and valve disease). The sample was divided into 3 subsets consisting of those: (1) lacking no services, (2) lacking 1 service, and (3) lacking 2 or more services. Results indicated that in all 3 subsets, most of the participants reported having insufficient or very insufficient income, 74%, 74% and 78%, respectively. Participants living in homes lacking any of the services had less income; more often had poor functional status, higher comorbidity, and lower educational level. Further, 38% lived in a home lacking 1 of the services considered; and 26% lacked 2 or more services. During the 12-month follow-up, there was a death rate of 60%. Mortality was higher in those who lived in homes without an elevator (hazard ratio [HR] 1.39, 95% CI 1.07-1.80) and in those who frequently felt cold (HR 1.39, 95% CI 1.01-1.92). In comparison with living in a home with all the services considered, mortality was higher for participants living in a home lacking 1 service (HR 1.42, 95% CI 1.10-1.93) or ≥2 services (HR 1.94, 95% CI 1.37-2.74). These results suggest poor housing conditions were associated with higher mortality in elders diagnosed with HF in this study. Thus, individuals with low SES
living in housing that lacked essential services had higher death rates. Because the study was conducted outside the U.S. where healthcare practices and SES variables differ, generalizability may be limited. However, Nagasako, Reidheadb, Waterman c, and Dunagana (2014), in their analysis of aggregate records suggested that adding individual SES and housing data to hospital readmission calculations could produce useful results to reduce high readmission rates in the U.S. They used hospital admissions ($N = 71,793$) from Missouri Medicare and Medicaid beneficiaries involving patients older than age 65 with a variety of diagnoses including HF. The analysis included 22,433 patients with a primary diagnosis of HF who had 29,874 hospital admissions. The cohort of HF patients was reported to have a median age of 81 years, were mostly White race and female. HF symptom severity was not reported. Two models were used to predict 30-day hospital readmission rates. The standard model that included illness-related variables was compared to a study model that added variables from the census data indicating education attainment and rates of poverty, housing vacancy, and unemployment. Using the standard model, results indicated a HF hospital readmission rate of 19.3% with a range of 14.5 to 28.5% compared to the study model that revealed a HF hospital readmission rate of 19.5% with a range of 17.6 to 25%. Although there was no significant difference in HF hospital readmissions between the models, the narrower range in the study model was considered promising to further explore adding SES data to readmission calculations. Thus, a study to examine the impact of individual variables on HF self-care among culturally diverse, low-income populations would contribute important data to help improve health outcomes.
Summary

Presently, 6.5 million Americans diagnosed with HF experience frequent hospitalizations, rapid readmissions, complex treatment regimens and are inadequately prepared to perform self-care leaving them vulnerable to lapses in management after care transitions from hospital to home (Albert et al., 2015). The cost of HF care using today’s healthcare delivery models is unsustainably high (Heidenreich et al., 2013; Goldgrab et al., 2018). Reduced healthcare use and mortality have been suggested as important measures of improved health outcomes for this population. A growing number of HF studies have examined transitional care interventions (TCIs) - medication adherence, HF education, clinic follow-up, telephone follow-up, telecare only, telecare in combination with other types of follow-up and home visit - with mixed results. Effectiveness of TCIs used with HF patients brings together intervention content, duration and provider. Intervention content consisting of clinic follow-up (primary care physician or registered nurse-led), telephone follow-up, telecare only and HF education had low effectiveness based on study results indicating lack of participant response. While medium and highly effective interventions included combinations of telephone follow-up, home visits, telecare with other interventions provided for 6 months or less indicated health benefits in reduced hospital readmission rates (Feltner et al., 2014). Although in clinical trials, the optimal duration for providing TCIs lacks consensus, the period of 7 to 30 days posthospital discharge indicated the time of highest risk for hospital readmission (Yancy et al., 2016). Findings that combinations of interventions provided by advanced practice nurses (APNs) compared to other professionals showed improved outcomes suggest that the HF population transitional needs are amenable to these skillsets. In a TCI trial
focusing on poor care transition coordination in adults with mixed diagnoses, Coleman and colleagues (2002) developed CTM®-15 instrument which measures the patient’s perceptions of care transition effectiveness in preparing them for self-care. Their data showed that participants who had favorable perceptions of preparation to perform self-care had lower readmission rates compared to cohorts who perceived poor preparation for self-care. Generalizability to HF patients who are multi-ethnic, carry heavy symptom burdens, complex care regimens and receive poor care transition coordination remains to be tested. Further, Allen et al. (2008) compared perceptions of symptom severity and life expectancy with results indicating a substantial discordance between healthcare professionals and patients with patients underestimating symptom severity and overestimating longevity. Allen et al. (2008) suggested further studies to examine patient perceptions were needed to better guide intervention selection and end of life planning. The current study examined HF patient’s perceptions of preparation for self-care, to dose APN-led transitional care interventions according to patient’s perceptions and to examine the costs of APN care delivery and healthcare use. Results are important to develop practice models and health policies by researchers, policy leaders, healthcare systems and to improve the outcomes of HF patients.
CHAPTER III.

METHODOLOGY

Research Design

This study used a randomized controlled trial and compared health outcomes and health care charges between two groups of adults hospitalized with heart failure: a control group that received routine postdischarge care and an intervention group that received routine postdischarge care plus follow-up telephone calls by advanced practice nurses (APNs). Both groups were followed for the first 8 weeks posthospital discharge. Data on health outcomes (i.e., perceived preparation for self-care, social support, and problem-solving style) were collected in both groups on hospital discharge, and on days 7, 14, 21, 28, 42 and 56; and morbidity/mortality data (i.e., urgent care visits, emergency department visits, rehospitalizations, deaths) were collected in both groups through 8 weeks posthospital discharge. Data on health care charges (i.e., urgent care visits, emergency department visits, and rehospitalizations in both groups (and charges for APN follow up, intervention group only) were collected at 8 weeks posthospital discharge. For the intervention group, APNs provided 8 weekly calls to assess HF symptoms and provide healthcare education regarding self-care. A detailed log was maintained by the APNs and were used to compute APN follow-up time, data on preventable healthcare usage (urgent care visits, emergency department visits, re-hospitalizations). Such methods in previous research were effective to examine patient perceptions of preparation to perform self-care (Coleman, 2006), and to examine APN healthcare charges (Naylor et al., 2004).
Setting

Participants were recruited from Jackson Health System (JHS) which includes Jackson Memorial Hospital, Jackson North Medical Center and Jackson South Community Hospital. With 1,828 licensed beds, JHS is an accredited, non-profit, tertiary care hospital system. JHS annually has between 22,000 to 25,000 heart failure (HF) admissions comprised of a racially diverse population with 65% Latino or Hispanic, 17% Black non-Hispanic, and 15% White non-Hispanic; 800 of which were projected to meet the study criteria. Patients diagnosed with HF are mainly discharged from two telemetry wards (West Wing 5 and West Wing 7) and the emergency department. Each telemetry ward has 33 rooms with double bed occupancy. Usual care consists of registered nurses and APNs providing discharge education including verbal and written instructions on: (1) coping with HF (2) being active (3) dealing with sleeping difficulty (4) discharge instructions (5) medical tests for HF (6) knowing your baseline (7) changes to your diet (8) procedures that may help (9) tracking your weight (10) travel concerns (11) signs of HF flare up (12) symptom tracking chart (13) taking medicines to control HF (14) understanding advanced HF and artificial heart pumps and (15) what is HF.

Sample

A convenient sample of 154 adults hospitalized with HF was recruited from the telemetry wards of Jackson Memorial Hospital in Miami, Florida. Potential participants were identified by their hospital admittance diagnosis of HF. These included African Americans, American Whites, Caribbean Blacks, Hispanics, Asians and other ethnicities. All HF diagnoses were included consisting of those with reduced ejection fraction as well as preserved ejection fraction. On enrollment, participants were asked to fill out a
demographic form and they self-reported their: language, gender, HF diagnosis duration, marital status, social support, employment, ethnicity, education level, household income and number of previous HF admissions in the past 2 years. Participants were also informed there was no obligation to participate and they would not incur any costs by participating. If they declined to participate, they continued to receive the usual hospital care. Eligible participants had to be able to understand spoken English or Spanish. Data collection was conducted by a bilingual advanced practice nurse (i.e., English, Spanish) reading the questions in their preferred language.

The inclusion criteria were: English or Spanish speaking men and women of 18 years or older with access to a telephone. Participants needed to have a medical record documentation of an HF diagnosis NYHA class I-IV, and the ability to secure prescribed medications within 30 days after hospital discharge. Potential participants meeting exclusion criteria were those with undetermined discharge residence, discharge to skilled nursing facility/hospice/palliative care, lacking reasonably reliable telephone access and any comorbid mental illnesses or conditions that did not allow completion of study instruments.

Retention strategies included two gift cards valued at $15.00 each. They were distributed at the end of weeks 1 and 8 for their time. Intervention group participants benefited from receiving health information from APNs specializing in HF care that they would not receive in usual care.

Recruitment was based on nonprobability convenience sampling; however, to minimize sampling bias, all eligible adults diagnosed with HF were approached until the full sample was obtained. Power Analysis for the sample size was determined based on a
significance level of $p = .05$ and acceptable power of 80% and above. For analysis of health outcomes with a medium effect, a sample of 154 (i.e., 76 and 78 in each group) was necessary to provide 80% power with two sample t-tests. For health care cost outcomes, a sample of 142 (i.e., 71 in each group) provided 80% power with two sample t-tests. The sample size ($N = 154$), accounted for 20% attrition, sufficiently provided 80% power with a significance level of .05 for the analyses.

**Data Collection Procedure**

An IRB approval was obtained from Florida International University and Jackson Health System. After IRB approval, an in-service about the study was provided to the hospital staff (physicians, nurse manager and staff nurses) on the telemetry wards. A flyer was posted in the staff-only area on these units as another means of disseminating information about the study.

Clinicians on JHS telemetry wards identified potentially eligible patients and their names were given to the PI or the research assistant (RA) of the study. One APN experienced in HF management was hired as a RA for the study. The APN spoke English and Spanish and was not a part of the participants’ care team. The APN visited the potential participant before hospital discharge and introduced the study in their preferred language. The APN assessed their willingness to participate. If they agreed to be in the study and met the inclusion/exclusion criteria, the APN explained the study in their preferred location (bedside, hospital designated discharge area or conference room) to protect participants’ privacy. The APN reviewed with the participants the contact timepoints, the study procedures and they were given the opportunity to ask questions. The APN obtained the participant’s written consent before the participant was discharged.
from the hospital. After obtaining consent, the APN used a computer-generated randomization table to assign participants to the intervention and control groups. Thus, each participant had an equal chance of being in the control or intervention group. The APN then collected demographic data, completed the Care Transitions Measure, the Multidimensional Scale of Perceived Social Support (MSPSS), The Social Problem-Solving Inventory Revised (SPSI-R) and the contact points with the participant.

Participants in the control group received telephone calls on posthospital discharge days 7, 14, 21, 28, 42 and 56 strictly to collect data on health outcomes (Care Transitions Measure [CTM®-15], Multidimensional Scale of Perceived Social Support (MSPSS), Social Problem-Solving Inventory Revised [SPSI-R]) and healthcare use and charges. Control group participants were not exposed to any of the APN intervention. This strategy has been used successfully in the previous studies.

In addition to these data collection procedures, on the telephone calls, the APN provided intervention group participants with HF self-care coaching according to the scripted TARGET HF Telephone Follow-up form (American Heart Association, 2018). The APN called intervention group participants by telephone in their preferred language, asked them about their daily weight measurements, activity level, adherence to prescribed medications and diet, and whether they were experiencing worsening symptoms. The APN used the teach-back method to evaluate the participant’s understanding. Time was provided for participants questions. The APN coached intervention participants with tasks such as notifying healthcare provider or pharmacy or scheduling additional telephone calls prior to the weekly calls. Participants also initiated calls to the APN to ask self-care questions on Monday to Friday 8:00 AM to 4:30 PM. The TARGET HF form
was used as a log to document the content of the intervention participant’s calls and the advice that was provided. If a health care concern was stated, the APN provided education according to telephone triage protocol for nurses (Briggs, 2016). If the participant voiced an urgent complaint such as fever, syncope or stroke-like symptoms, the participant was directed to use the 911 emergency systems. The facility’s medical director of the Advanced Heart Failure and Cardiac Transplant Program was available to the APN as a backup physician for consultation. This procedure was used successfully in previous studies examining the effects of APN follow-up (Naylor et al., 2004; Coleman et al., 2006; Bowles et al., 2011). The APN charges, including time devoted by APNs to the preparation of patient education materials, was calculated by assessing the follow-up related effort of APNs and multidisciplinary team experts (from documentation on the TARGET HF form) and applying representative annual salaries for APNs and individual team members plus benefits.

The APNs were trained in the study protocol, recruitment process, and consent procedures by the PI. The PI also trained all APNs in using TARGET HF form. All APNs completed the CITI course for human subjects’ protection prior to interacting with participants. Weekly research team meetings of all team members focused on enrollment, study progress, changes, updates, any problems and reinforcement of study protocols.

**Instruments**

**Health Outcomes**

*Patients’ perceptions of preparation to perform self-care*

This variable was measured by the *Care Transitions Measure, CTM®-15*. It is a 15-item Likert-scale that was completed by the participant or the informal caregiver and
measured their perceptions of care transition planning effectiveness in preparing them for self-care. Each item has 5 possible choices: strongly-disagree, disagree, agree, strongly-agree and don’t-know/can’t-remember/not-applicable. Total scores range from 0-100 where higher summative scores indicated more favorable perceptions of care transition or preparation to perform self-care (Coleman et al., 2002). The 15 items are sub-divided into four subscales with objectives to (1) inpatient - identify staff inclusion of patient preferences in discharge planning, (2) at-discharge - check for patient’s awareness of self-care behaviors, (3) follow-up – check for clear follow-up schedule and (4) medications – check’s patient knowledge of medication purpose administration and side effects. In previous studies, CTM®-15 was found to be valid and reliable with Pearson’s correlation coefficient 0.36 to 0.46 and Cronbach’s alpha 0.81 to 0.87 (Bakshi et al., 2012).

Perceived Social support

This variable was measured by Multidimensional Scale of Perceived Social Support (MSPSS) a 12-item Likert scale where higher summative scores indicated higher perceived support from significant others, family and friends. Participants rate each of the 12 items on a 7-point scale from 1 “very strongly disagree” to 7 “very strongly agree.” MSPSS, in a sample of HF participants, showed very good internal consistency with Cronbach's alpha ranging from 0.81 to 0.98. (Pedersen, Spinder, Erdman, & Denollet, 2009).

Problem-solving

This variable was measured by the Social Problem-Solving Inventory Revised-Short Form (SPSI-R:S). It is a 25-item, self-report instrument that evaluates
characteristics of social problem-solving, including problem-solving orientation and problem-solving performance (D’Zurilla, Nezu, & Maydeu-Olivares, 2002). The *SPSI-R:S* consists of five subscales: positive problem orientation (PPO), negative problem orientation (NPO), rational problem-solving style (RPS), impulsivity/carelessness style (ICS), and avoidance style (AS). Raw scores on each subscale range from 0 to 20, and these raw scores are plotted on profile sheets for conversion to age-based standard scores that range from 47 to 157. Higher scores indicate adaptive social problem-solving. While on the subscales, adaptive problem-solving is indicated by higher scores on PPO and RPS subscales and lower scores on NPO, ICS, and AS. Graven et al. (2015) reported adequate internal consistency (Cronbach's alpha ranging from 0.77 to 0.86) and used the instrument in their study with a sample of HF participants.

**Patient characteristics**

These data were collected by interview including: duration of HF diagnosis, education, race ethnicity and gender; and electronic medical record review gathered age, insurance provider (Medicare, Medicaid, private), HF symptom severity (NYHA class), 30-day ED visit/unplanned readmission within previous 24 months.

**HF symptom severity (New York Heart Association [NYHA] Functional class I-IV).** Data on NYHA functional class were collected from electronic medical records at the time of enrollment. The healthcare provider had recorded the NYHA functional classification as a diagnosis. The NYHA functional classification (class I-IV) represent the degree of symptomatic limitation manifesting as undue fatigue, palpitation, breathlessness, or angina chest pain (American Heart Association, 2017). NYHA Class I patients have no limitations or ordinary activity does not provoke symptoms. The NYHA
Class II patients have slight limitation of physical activity being comfortable at rest but ordinary physical activity aggravates symptoms. Patients diagnosed with NYHA class III symptoms have marked limitation of physical activity; they are comfortable at rest but less than ordinary activity produces symptoms.Patients diagnosed to be NYHA class IV are severely symptomatic; they are unable to perform any physical activity without discomfort with symptoms present even at rest and undertaking any physical activity increases discomfort (Reisfield & Wilson, 2005).

**Telephone Follow-up**

The *TARGET HF* form (American Heart Association [AHA], 2018) served as a log to collect information and as a guide to provide advice by the APN at hospital discharge and on eight weekly telephone follow-up calls. The AHA developed the form to assist HF professionals as part on an initiative to reduce 30-day hospital readmissions for HF patients. Further, the form is a coaching guide to promote HF self-care in measuring weight, staying active, adhering to prescribed medications and diet, and monitoring, recognizing and seeking help for worsening symptoms. The *TARGET HF* form consists of four sections (demographics, patient education, medications and self-care management for HF and general information). Each section has scripted questions that the APN asked and documented participants’ responses and a prompted to use teach-back method to evaluate the participant’s understanding. In the general information section, the APN provided time for and documented participants’ questions; in addition to assisting them as indicated with tasks such as notifying healthcare provider or pharmacy or scheduling additional telephone calls prior to the weekly calls. Participants also initiated calls to APNs to answer self-care questions on Monday to Friday 8:00 AM.
to 4:30 PM. *TARGET HF* form was also be used to log the content of the participant’s call and the advice that was provided.

**Preventable healthcare utilization**

These data were collected by electronic medical record and by weekly telephone follow-up call for healthcare encounters outside the study hospital system. Healthcare utilization charges included number of emergency department visits and number of days hospitalized during the 60 days posthospital discharge. Charges for APN services were determined by adding the total APN time spent on the telephone follow-up care to participants including charting, any consultation with physicians and then calculating a charge for this time based on average annual salary for APNs in the South Florida area plus fringe benefits. Realizing that charges do not equal actual costs, the intent will be to provide a comparison of charges between participants.

**Data Management**

Data from each participant were contained in an individual file (paper, not electronic) with a study number on it. Each paper file included demographic data and APN’s documentation of the content of conversations with the participant. The informed consent was stored in a separate file. A master log book and study files were be kept in a locked cabinet with the participants’ names and their assigned study number. Only the PI, and the APNs had access to the data. There was a master contact log with the list of dates the participants were contacted. The PI and APNs reviewed the contact log daily and the APNs contacted the appropriate participants. Data were entered in a statistical program, Statistical Package for the Social Sciences 26 (*SPSS*) for Windows. The PI verified data entry to minimize errors. The PI used *SPSS* to examine frequencies and
descriptive statistics to look for missing data and possible data entry errors. After correcting any detected errors, the PI merged the SPSS file of newly-entered data with the already-cleaned data. Data review was ongoing with continuous feedback as needed to maintain data quality.

**Data Analysis**

**Research Questions**

Research Question 1: Comparing the control and the APN intervention group, are there differences in health outcomes by perceptions of preparation to perform self-care, social support and problem-solving style at on posthospital discharge days 1, 7, 14, 21, 28, 42 and 56?

Hypothesis 1: Intervention group participants with APN follow-up telephone calls would have an improved perception of health as measured by the CTM®-15, MSPSS, and the SPSIR-S when compared with control group participants without the APN follow-up telephone calls. Participants were compared between the control group and the intervention group on CTM®-15, MSPSS, and the SPSIR-S (i.e., whether the means of two populations; the control and intervention group differ), at each timepoint, using two-sample t-tests for independent groups or the non-parametric analog to the t-test, Chi-square test of independence. Significant differences in means supported the hypotheses. Exploratory analysis was performed initially to identify any differences between the groups with respect to the independent variables as well as for any missing data patterns and potential outliers. There were no outliers and few missing data. Both control and intervention groups were equally balanced with respect to group characteristics or independent variables.
Research Question 2: Comparing the control and the APN intervention group, are there differences in health outcomes by rate of adherence to routine healthcare follow-up visits, morbidity (i.e., urgent care visits, emergency department visits, rehospitalizations) and mortality at 8 weeks posthospital discharge?

Hypothesis 2: Intervention group participants with APN follow-up would have improved health (adherence with routine healthcare follow-up visits), no non-scheduled physician visits, no urgent care visits, no emergency department visits and no rehospitalizations as compared to the control group participants without APN follow-up telephone calls. The nonscheduled physician visits, urgent care visits, emergency department visits, and rehospitalizations were coded as yes/no. Groups were compared with respect to health outcomes using Chi-square test for equality of proportions.

Research Question 3: Comparing the control and the APN intervention group, are there differences in healthcare charges (i.e., urgent care visits, emergency department visits, rehospitalizations, and charges for APN follow up [intervention group only]) at 8 weeks posthospital discharge?

Hypothesis 3: The total charge for healthcare services for participants with APN follow-up telephone calls would be lower compared to participants without APN follow-up telephone calls. Two-sample t-tests were used to compare differences in means across the two groups for the total medical charges, for specific charges related to emergency department visits, urgent care visits and hospitalizations. Healthcare charges (i.e., urgent care visits, emergency department visits, rehospitalizations, and charges for APN follow up with the intervention group only)?
In conclusion, HF patients experience complex treatment regimens, high healthcare usage and high economic burden using the current healthcare delivery models and most are not prepared for hospital discharge. Previous studies suggest participants that perceived adequate preparation for self-care had improved health and cost outcomes compared to others that perceived inadequate preparation for self-care. However, previous studies with participants diagnosed with HF were mostly comprised of White samples with good/excellent health and had few symptomatic limitations. Studies with multi-ethnic HF patients with heavy symptom burdens, complex care regimens that receive poor care transition coordination are limited. The current study proposes to examine HF patient’s perceptions of preparation for self-care in an understudied racially diverse sample (Whites, Blacks and Hispanics). These data are important to develop improved transitional care interventions, examine healthcare outcome over time and examine possible preventable healthcare use. Results are needed to develop practice models and health policies by researchers, policy leaders, healthcare systems and the population of HF patients.
CHAPTER IV.

RESULTS

The purpose of this randomized controlled trial was to compare health outcomes, and healthcare charges between two groups of adults hospitalized with a heart failure (HF) diagnosis. A control \((n = 78)\) group received routine postdischarge care. An intervention group \((n = 76)\) received routine post discharge care plus follow-up telephone calls by advanced practice nurses (APNs) on posthospital discharge days 1, 7, 14, 21, 28, 42 and 56. Both groups were followed for the first 8 weeks posthospital discharge to examine health outcomes (i.e., perceived preparation for self-care, social support, problem-solving orientation), healthcare charges (i.e., urgent care visits, emergency department visits, rehospitalizations) and charges for the APN follow-up (intervention group only). Results from this study are reported in this chapter.

Sample

A total sample of 166 adults, ages ranged from 29 to 91 years, hospitalized with a diagnosis of HF were recruited from the telemetry wards at Jackson Health System in Miami, Florida. The number of participants lost to attrition who were unable to be reached by telephone were 12 participants. The final sample consisted of 154 participants: 76 in the intervention group and 78 in the control group. During the 8-weeks follow-up, 10 participants \((6.5\%)\) had an interruption of their HF self-care due to being transferred to skilled nursing facilities, and another 6 \((3.9\%)\) died due to the severity of their illness and not related to the study intervention.

Characteristics of the sample are presented in Tables 1- 5. The participants’ mean age was 66 years \((SD = 13.2)\) (Table 1), most were male \((65.6\%)\) and unpartnered
(70.8%). Those that were partnered had an average of 12 years in their current relationships. The participants were almost evenly divided between English (48%) and Spanish (41.6%) speakers with a small number that were bilingual (10.4%). A little over half (50.6%) were of Hispanic ethnicity (Table 2) while the others were Caribbean Blacks (20.8%), African Americans (18.8%), Non-Hispanic Whites (7.1%) and others (2.6%). The majority (74%) had an educational background of completed high school or less.

Most reported having a social support person (Table 3) with almost half (40.3%) of the participants reported receiving social support from their children. Although most participants lived with others: children (31.2%), spouse/partner (27.3%) and other family/non-family (17.5%), nearly a quarter (24%) of the participants lived alone. All participants were hospitalized due to HF symptoms and the classification of these symptoms (Table 4) were NYHA II slight limitation (31.2%), NYHA III marked limitation (42.2%) and NYHA IV severe limitation (26.6%). The mean number of years diagnosed with HF was 6 (SD=6.53) and the mean length of stay in days during the index hospitalization when enrollment occurred was 9.6 (SD=8.1). The mean number of self-reported hospitalizations in the previous 24 months was 4.8 (SD=5.3). Most (52.5%) had household income (Table 5) of $50,000 or less, were unemployed (88.3%) mostly due to retirement (42.2%) and receiving disability (39%), and a large majority (79.2%) had health insurance that was publicly funded.

Characteristics of the intervention and control groups are presented in Tables 1-5. The two groups were similar, showing no significant differences in their demographic or background characteristics. Comparing the demographic and background characteristics of the 12 participants who were unable to be reached by telephone to the final sample,
this attrition group had more females (58.3% vs 34.4%), more English speakers (66.7% vs 48%), more non-Hispanic Whites (25% vs 7.1%) and a larger percentage of persons markedly limited HF symptoms (NYHA class III) (67% vs. 42.2%). However, none of these differences were significant. In addition, there was an insignificant self-reported higher number of past admissions in the prior 24 months in the attrition group (8 vs 5) compared to the study sample. Previous research indicates poorer outcomes among those with the most rehospitalizations (Benjamin et al., 2019).

Table 1

<table>
<thead>
<tr>
<th>Demographic and Background Characteristics</th>
<th>Total Sample (N = 154)</th>
<th>Intervention (n = 76)</th>
<th>Control (n = 78)</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age in years</td>
<td>66 (SD = 13.2)</td>
<td>66 (SD = 13.3)</td>
<td>65 (SD = 13.2)</td>
<td>t = .08</td>
</tr>
<tr>
<td>Age ranges</td>
<td>29 – 91</td>
<td>29 – 89</td>
<td>36 – 91</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>N (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>101 (65.6%)</td>
<td>48 (63.2%)</td>
<td>53 (67.9%)</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>53 (34.4%)</td>
<td>28 (36.8%)</td>
<td>25 (32.1%)</td>
<td></td>
</tr>
<tr>
<td>Relationship status</td>
<td>N (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
</tr>
<tr>
<td>Unpartnered</td>
<td>109 (70.8%)</td>
<td>52 (68.4%)</td>
<td>57 (73.1%)</td>
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</tr>
<tr>
<td>Partnered</td>
<td>45 (29.2%)</td>
<td>24 (31.6%)</td>
<td>21 (26.9%)</td>
<td></td>
</tr>
<tr>
<td>Mean years in current relationship</td>
<td>12 (SD=19.39)</td>
<td>13.76 (SD=20.76)</td>
<td>11.21 (SD=18)</td>
<td>t = .06</td>
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<tr>
<td>Language</td>
<td>N (%)</td>
<td>n (%)</td>
<td>n (%)</td>
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<tr>
<td>English</td>
<td>74 (48%)</td>
<td>35 (46%)</td>
<td>39 (50%)</td>
<td></td>
</tr>
<tr>
<td>Spanish</td>
<td>64 (41.6%)</td>
<td>30 (39.5%)</td>
<td>34 (43.6%)</td>
<td></td>
</tr>
<tr>
<td>Bilingual</td>
<td>16 (10.4%)</td>
<td>11 (14.5%)</td>
<td>5 (6.4%)</td>
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</table>
Table 2

Demographic and Background Characteristics (Continued)

<table>
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<tr>
<th></th>
<th>Total Sample (N = 154)</th>
<th>Intervention (n = 76)</th>
<th>Control (n = 78)</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race/ethnicity</strong></td>
<td></td>
<td></td>
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<tr>
<td>Hispanic</td>
<td>78 (50.6%)</td>
<td>39 (51.3%)</td>
<td>39 (50%)</td>
<td>χ² = .71</td>
</tr>
<tr>
<td>Caribbean/other Black</td>
<td>32 (20.8%)</td>
<td>13 (17.1%)</td>
<td>19 (24.3%)</td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>29 (18.8%)</td>
<td>16 (21%)</td>
<td>13 (16.7%)</td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>11 (7.1%)</td>
<td>5 (6.6%)</td>
<td>6 (7.7%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>4 (2.6%)</td>
<td>3 (3.9%)</td>
<td>1 (1.3%)</td>
<td></td>
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<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school completed or less</td>
<td>114 (74%)</td>
<td>60 (78.9%)</td>
<td>54 (69.3%)</td>
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</tr>
<tr>
<td>Post-secondary education</td>
<td>40 (26%)</td>
<td>16 (21.1%)</td>
<td>24 (30.7%)</td>
<td></td>
</tr>
<tr>
<td>Table 3</td>
<td>Support Characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>-------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Sample (N = 154)</td>
<td>Intervention (n = 76)</td>
<td>Control (n = 78)</td>
<td>Statistics</td>
</tr>
<tr>
<td><strong>Support person</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child/other family</td>
<td>62 (40.3%)</td>
<td>33 (43.4%)</td>
<td>29 (37.2%)</td>
<td>$\chi^2 = .46$</td>
</tr>
<tr>
<td>Spouse/partner</td>
<td>42 (27.2%)</td>
<td>23 (30.3%)</td>
<td>19 (24.3%)</td>
<td></td>
</tr>
<tr>
<td>Non-family</td>
<td>23 (14.9%)</td>
<td>8 (10.5%)</td>
<td>15 (19.2%)</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>15 (9.7%)</td>
<td>8 (10.5%)</td>
<td>7 (9%)</td>
<td></td>
</tr>
<tr>
<td>Parent</td>
<td>11 (7.1%)</td>
<td>4 (5.3%)</td>
<td>7 (9%)</td>
<td></td>
</tr>
<tr>
<td>Sibling</td>
<td>1 (0.6%)</td>
<td>0</td>
<td>1 (1.3%)</td>
<td></td>
</tr>
<tr>
<td><strong>Living with</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child/other family</td>
<td>48 (31.2%)</td>
<td>20 (26.3%)</td>
<td>28 (35.9%)</td>
<td></td>
</tr>
<tr>
<td>Spouse/partner</td>
<td>42 (27.3%)</td>
<td>24 (31.7%)</td>
<td>18 (23.1%)</td>
<td></td>
</tr>
<tr>
<td>Alone</td>
<td>37 (24%)</td>
<td>21 (27.6%)</td>
<td>16 (20.5%)</td>
<td></td>
</tr>
<tr>
<td>Non-family</td>
<td>18 (11.7%)</td>
<td>8 (10.5%)</td>
<td>10 (12.8%)</td>
<td></td>
</tr>
<tr>
<td>Parent</td>
<td>7 (4.5%)</td>
<td>2 (2.6%)</td>
<td>5 (6.4%)</td>
<td></td>
</tr>
<tr>
<td>Sibling</td>
<td>2 (1.3%)</td>
<td>1 (1.3%)</td>
<td>1 (1.3%)</td>
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</tr>
</tbody>
</table>
Table 4

**Heart Failure Characteristics**

<table>
<thead>
<tr>
<th>NYHA functional class</th>
<th>Total Sample (N = 154)</th>
<th>Intervention (n = 76)</th>
<th>Control (n = 78)</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>χ² = .48</td>
</tr>
<tr>
<td>NYHA II</td>
<td>48 (31.2%)</td>
<td>27 (35.5%)</td>
<td>21 (27%)</td>
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</tr>
<tr>
<td>NYHA III</td>
<td>65 (42.2%)</td>
<td>31 (40.8%)</td>
<td>34 (43.5%)</td>
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</tr>
<tr>
<td>NYHA IV</td>
<td>41 (26.6%)</td>
<td>18 (23.7%)</td>
<td>23 (29.5%)</td>
<td></td>
</tr>
<tr>
<td>Mean HF duration in years</td>
<td>6 (SD=6.53)</td>
<td>6.3 (SD=7.58)</td>
<td>5.7 (SD=5.35)</td>
<td>t=.59</td>
</tr>
<tr>
<td>Mean length of stay in days of index admission</td>
<td>9.6 (SD=8.1)</td>
<td>8.74 (SD=6)</td>
<td>10.42(SD=9.7)</td>
<td>t=.1.3</td>
</tr>
<tr>
<td>Number of self-reported admissions in previous 24 months</td>
<td>4.8 (SD=5.3)</td>
<td>4.3 (SD=4)</td>
<td>5.4 (SD=6.3)</td>
<td>t=.2</td>
</tr>
<tr>
<td>Yearly household income</td>
<td>Total Sample ((N = 154))</td>
<td>Intervention ((n = 76))</td>
<td>Control ((n = 78))</td>
<td>Statistics</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------</td>
<td>--------------------------</td>
<td>---------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Less than $10,000</td>
<td>21 (13.6%)</td>
<td>8 (10.5%)</td>
<td>13 (16.7%)</td>
<td>(\chi^2 = 0.8)</td>
</tr>
<tr>
<td>$10,000 to $49,999</td>
<td>60 (38.9%)</td>
<td>30 (39.5%)</td>
<td>30 (38.5%)</td>
<td></td>
</tr>
<tr>
<td>$50,000 to $79,999</td>
<td>36 (23.5%)</td>
<td>21 (27.6%)</td>
<td>15 (19.2%)</td>
<td></td>
</tr>
<tr>
<td>$80,000 and above</td>
<td>37 (24%)</td>
<td>17 (22.4%)</td>
<td>20 (25.6%)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Employment</th>
<th>(N) (n) (n)</th>
<th>(\chi^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed full time</td>
<td>13 (8.4%) 6 (7.9%) 7 (9%)</td>
<td>.31</td>
</tr>
<tr>
<td>Employed part time</td>
<td>5 (3.3%) 4 (5.3%) 1 (1.3%)</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>136 (88.3) 66 (86.8%) 70 (89.7%)</td>
<td>.32</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Occupation</th>
<th>(N) (n) (n)</th>
<th>(\chi^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retired</td>
<td>65 (42.2%) 35 (46.1%) 30 (38.5%)</td>
<td></td>
</tr>
<tr>
<td>Disabled</td>
<td>60 (39%) 26 (34.2%) 34 (43.6%)</td>
<td></td>
</tr>
<tr>
<td>Professional/skilled</td>
<td>29 (18.8%) 15 (19.7%) 14 (17.9%)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Insurance type</th>
<th>(N) (n) (n)</th>
<th>(\chi^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>122 (79.2%) 58 (76.3%) 64 (82.1%)</td>
<td>.27</td>
</tr>
<tr>
<td>Private</td>
<td>11 (7.2%) 8 (10.5%) 3 (3.8%)</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>21 (13.6%) 10 (13.2%) 11 (14.1%)</td>
<td></td>
</tr>
</tbody>
</table>
Effects of the APN Intervention on Health Outcomes

Perceived Preparation for Self-care

Participants responded to their perceived preparation for HF self-care using the Care Transitions Measure, (CTM®-15) instrument at seven different timepoints (i.e. posthospital discharge days 1, 7, 14, 21, 28, 42 and 56. The CTM®-15 measures subjective perceptions of their preparation for HF self-care. The scores on this instrument can range from 0-100 where higher summative scores are indicative of a more favorable perception of preparation to perform HF self-care. The CTM®-15 has 15 items which are sub-divided into four subscales with objectives to evaluate (1) inpatient - identify staff inclusion of patient preferences in discharge planning, (2) at-discharge - check for patient’s awareness of self-care behaviors, (3) follow-up – check for clear follow-up schedule and (4) medications – check’s patient knowledge of medication purpose administration and side effects. Results of the CTM®-15 are presented in Table 6. At Time 1 (i.e., posthospital discharge day 1), the overall mean CTM®-15 score of the participants was relatively high ($M = 75.58$, $SD = 22.9$) and ranged from 0 ($n = 3$, 1.9%) to 100 ($n = 56$, 36.4%). This indicated that participants perceived their preparation for self-care at a level higher than the midpoint of the total scale. The CTM®-15 means for the intervention group ($M = 77.08$, $SD = 21.4$) and the control group 74.13/24.3 ($M = 74.13$, $SD = 24.3$) using the two sample t-test results indicated no significant differences, $t(154)= -0.8$, $p=.43$ in perceived preparation for self-care between the groups at Time 1 (i.e., posthospital discharge day 1).

At Time 2 (i.e., posthospital discharge day 7), the mean scores of perceived preparation for self-care decreased ($M = 62.86$, $SD = 31.6$) indicating that the
participants’ perceived preparation for self-care decreased compared to the first day posthospital discharge (i.e., Time 1). The intervention group mean and the control group mean scores ($M_I = 63.25, SD = 29.9$ vs. $M_C = 62.49, SD=33.3$) indicated that while the participants perceived preparation for self-care decreased at Time 2, there were no significant differences in perceived preparation for self-care, $t(154) = -0.15, p = 0.88$ between the groups.

At day 14 posthospital discharge (i.e., Time 3), 12 participants had been admitted to skilled nursing facilities or died; 5 from the intervention group and 7 from the control group. The overall mean $CTM^{®}$-15 scores ($M = 48.84, SD = 32.4$) were lower than at Time 1 and Time 2, indicating decreasing perceived preparation for self-care posthospital discharge. The difference between the scores of the groups was not significant, $t(142) = -0.4, p <0.69$).

At day 21 posthospital discharge (i.e., Time 4) the overall mean scores of perceived preparation for self-care remained low ($M = 46.71, SD = 31.1$) indicating lesser perceived preparation for self-care compared to Time 1 and Time 2. However, the intervention group mean and the control group mean scores ($M_I = 51.83, SD = 26.8$ vs. $M_C = 41.6, SD = 34.3$) indicated higher perceived preparation for self-care in the intervention group, although this difference was not significant, $t(142) = -1.98, p = 0.05$).

At Time 5 (i.e., posthospital discharge day 28), the overall mean $CTM^{®}$-15 scores ($M = 48.56, SD = 28.9$) were higher than at Time 4, indicating increasing perceived preparation for self-care posthospital discharge. There was a significant difference between the groups, however, with the intervention group mean increased ($M = 60.45$, $SD = 21.1$) while the control group mean decreased ($M = 36.65, SD = 30.8$), $t(142) = -
5.37, p < .001). When comparing individual items on the CTM®-15 using two-sample t-test, results indicated significant differences between intervention and control groups on all four subscales: (1) discharge planning ($M_I = 3.04, SD = .74$ vs. $M_C = 2.36, SD = 1.1, t(142) = -4.34, p < .001$); (2) awareness of self-care behaviors ($M_I = 2.65, SD = .87$ vs. $M_C = 1.78, SD = 1.13, t(142) = -5.15, p < .001$); (3) follow-up ($M_I = 2.63, SD = .94$ vs. $M_C = 1.82, SD = 1.15, t(142) = -4.62, p < .001$, eta squared = 0.13; and (4) medications ($M_I = 3.08, SD = .6$ vs. $M_C = 2.78, SD = .9$, $t(142) = -2.38, p = .02$, eta squared=0.04).

At Time 6 (i.e., posthospital discharge day 42), the CTM®-15 sample means ($M = 47.5, SD = 27.3$) remained low compared to Time 5 indicating an overall decreased perceived preparation for self-care posthospital discharge. However, the intervention group mean and the control group mean scores ($M_I = 67.29, SD = 16.5$ vs. $M_C = 27.43, SD=20.6$) indicated that while the intervention participants perceived increasing preparation for self-care, the control group perceived decreasing preparation for self-care. This difference was significant, $t(141) = -12.67, p < .001$ with a large effect in the magnitude of differences in the means (eta squared=0.54).

At Time 7 and the last timepoint (i.e., posthospital discharge day 56) the overall mean CTM®-15 scores ($M = 46.67, SD =27.6$) remained low compared to Time 6 indicating decreased perceived preparation for self-care posthospital discharge. However, there was a significant difference between the intervention and control group means ($M_I =67.37, SD =16.6$ vs. $M_C = 25.36, SD=19$, $t(138) = -13.831, p=.000$) indicating the intervention group perceived preparation for self-care at a level higher than the midpoint of the total scale while the control group perceived preparation for self-care that was at a level much lower than the midpoint of the total scale. At this final timepoint, results
comparing the CTM®-15 four subscales indicated significant differences with higher intervention group means than the control group: (1) discharge planning ($M_I=3.09$, $SD = .5$ vs. $M_C = 2.19$, $SD= .99$, $t(138) = -6.67$, $p < .001$; (2) awareness of self-care behaviors ($M_I=3.05$, $SD = .54$ vs. $M_C = 2.61$, $SD= .82$, $t(138) = -3.7$, $p < .001$; (3) follow-up ($M_I =2.97$, $SD = .64$ vs. $M_C = 1.35$, $SD= .77$, $t(138) = -13.46$, $p < .001$; and (4) medications ($M_I=3.05$, $SD = .5$ vs. $M_C = 2.61$, $SD= .8$, $t(138) = -3.7$, $p = .02$.

**Perceived Social Support**

Social support was measured at seven different timepoints (*i.e.*, posthospital discharge days 1, 7, 14, 21, 28, 42 and 56) using the Multidimensional Scale of Perceived Social Support (MSPSS). The MSPSS scores range from 1 to 7 with higher scores indicating greater perceived social support. At Time 1 (*i.e.*, posthospital discharge day 1), the overall mean ($M = 5.3$, $SD= 1.6$) of perceived social support from family, friends and significant others (*i.e.*, MSPSS 3 subscales) indicated that the participants perceived themselves as having a high level of social support. See Table 7. Scores ranged from 1 ($n = 5$, 3.2%) to 7 ($n = 42$, 27.3%) with the majority at the high end of the scale. The intervention group mean and the control group mean scores ($M_I = 5.43$, $SD = 1.4$ vs. $M_C = 5.17$, $SD= 1.7$) indicated that the perceived social support was equivalent between the groups. There was no significant difference between the intervention group and the control group at Timepoint 1, $t(154) = -1.01$, $p = 0.32$.

The overall mean MSPSS score at Time 2 (*i.e.*, posthospital discharge day 7), ($M = 5.16$, $SD = 1.7$) did not fluctuate much from Time 1. Scores ranged from 1 ($n = 5$, 3.2%) to 7 ($n = 42$, 18.7%). There was an insignificant higher mean in the intervention
group compared to the control group mean ($M_I = 5.29, SD = 1.6$ vs. $M_C = 5.03, SD = 1.8$), $t(154) = -.93, p = .36$.

At Time 3 (i.e., posthospital discharge day 14), the overall mean score for perceived social support for the total sample showed very little change compared to the previous timepoints ($M=5.27, SD=1.6$) and there were no significant differences between the means of the intervention and control groups ($M_I = 5.45, SD = 1.5$ vs. $M_C = 5.08, SD = 1.7$), $t(142) = -1.38, p = .17$).

At posthospital discharge day 21 (i.e., Time 4), overall mean scores of perceived support remained relatively high ($M=5.27, SD=1.6$) with scores ranging from 1 ($n = 3, 1.9\%$) to 7 ($n = 39, 25.3\%$) and no significant difference between the means of the intervention and control groups ($M_I = 5.46, SD = 1.4$ vs. $M_C = 5.08, SD = 1.7$), $t(142) = -1.44, p = .15$).

The sample mean at Time 5 (i.e., posthospital discharge day 28) remained relatively high indicating the participants perceived having a high level of social support ($M=5.27, SD=1.6$) without significant differences between the two groups’ means ($M_I = 5.46, SD = 1.4$ vs. $M_C = 5.07, SD = 1.7$), $t(142) = -1.46, p = .15$.

At posthospital discharge day 42 (i.e., Time 6), perceived social support scores ranged from 1 ($n = 4, 2.6\%$) to 7 ($n = 38, 24.7\%$) and the sample mean remained relatively high ($M = 5.21, SD = 1.6$). Intervention and control group means remained high showing no significant differences ($M_I = 5.35, SD = 1.5$ vs. $M_C = 5.07, SD = 1.7$), $t(141) = -1.01, p = .32$).

Results at Time 7 (i.e., posthospital discharge day 56) indicated continued relatively high levels of perceived social support, unchanged compared to the previous
timepoints ($M=5.24$, $SD=1.6$). Means of the intervention and control groups showed no significant differences ($M_I = 5.46$, $SD = 1.4$ vs. $M_C = 5.01$, $SD = 1.7$), $t(138) = -1.68$, $p=-10$).

**Problem-solving**

At seven different timepoints (i.e. posthospital discharge days 1, 7, 14, 21, 28, 42 and 56), participants responded to The *Social Problem-Solving Inventory Revised-Short (SPSI-R:S)* to measure adaptive and maladaptive problem-solving orientation and problem-solving styles (rational, impulsive and avoiding). Standardized scores can range from 47 to 157 with adaptive problem-solving orientation indicated by higher cores. Subscales of positive problem orientation (PPO) and rational problem-solving style (RPS) higher scores indicate an adaptive problem-solving orientation. While lower scores indicate adaptive problem-solving of subscales negative problem orientation (NPO), impulsivity/carelessness style (ICS), and avoidance style (AS). At posthospital discharge day 1 (i.e., Time 1), the overall mean (Table 9) ($M = 104.63$, $SD = 19.4$) measured towards the higher end of the scale and indicated an adaptive problem-solving orientation. Scores ranged from 47 ($n = 1$) to 139 ($n = 1$) with several modes including: 116 ($n = 6$), 117 ($n = 6$) and 134 ($n = 6$). Using two-sample t-test, results indicated no significant difference between the means of the intervention and control groups ($M_I = 106.21$, $SD = 17.2$ vs. $M_C = 103.1$, $SD = 21.4$), $t(154) = -1$, $p = .32$). The mean score for PPO subscale ($M = 105.84$, $SD = 17.6$) and RPS ($M = 105.76$, $SD = 17$) were similarly high, indicating an overall adaptive problem-solving style. The NPO mean 101.17 ($SD = 17.2$) indicated a relatively high level of maladaptive problem-solving orientation that was consistent for both intervention and control groups without significant difference ($M_I$
The means of the two maladaptive problem-solving styles *ICS* (*M* = 100.07, *SD* = 19.1) and *AS* (*M* = 99.81, *SD* = 20.8) indicated high levels of maladaptive problem-solving styles among the sample. Comparing intervention and control group means indicated no significant differences on maladaptive problem-solving styles: *ICS* (*M_I* = 98.46, *SD* = 18.1 *vs.* *M_C* = 101.64, *SD* = 20.1), *t*(154) = 1.03, *p* = .30; or *AS* (*M_I* = 98.64, *SD* = 18.1 *vs.* *M_C* = 100.95, *SD* = 23.2), *t*(154) = .69, *p* = .49).

At posthospital discharge day 7 (*i.e.*, Time 2), the *SPSI-R:S* score (*M* = 104.28, *SD* = 19.4) was unchanged compared to posthospital discharge day 1. This score indicated a high level of adaptive problem-solving orientation that was supported by correspondingly high and similar scores between intervention and control groups on *PPO* (*M_I* = 107.11, *SD* = 18.6 *vs.* *M_C* = 104.5, *SD* = 19.3), *t*(154) = -.86, *p* = .39; and *RPS* (*M_I* = 104.93, *SD* = 16.7 *vs.* *M_C* = 107.01, *SD* = 19.7), *t*(154) = .71, *p* = .48). Means of *NPO* (*M* = 101.56, *SD* = 17), *ICS* (*M* = 99.55, *SD* = 20.8) and *AS* (*M* = 99.97, *SD* = 20.8) indicated high levels of maladaptive problem-solving orientation that were similar to those reported at Time 1 (*i.e.*, posthospital discharge day 1). There were no significant differences comparing the intervention and control groups.

The *SPSI-R:S* score (*M* = 104.55, *SD* = 19.7) at posthospital discharge day 14 (*i.e.*, Time 3) was nearly unchanged compared to the previous timepoints and indicated a relatively high level of adaptive problem-solving orientation with *PPO* mean of 106.21 (*SD* = 19.2) and *RPS* mean of 105.51 (*SD* = 17.1). Scores indicating high levels of maladaptive problem-solving orientation were also unchanged compared to Time 1 and Time 2 with means of *NPO* = 101.37 (*SD* = 17.4), *ICS* = 100.15 (*SD* = 19.5) and *AS* =...
99.81 (SD = 20.8). The average scores of the intervention and control groups were very similar.

There was little or no change in the SPSI-R:S score (M = 104.58, SD = 19.7) at Time 4 (i.e., posthospital discharge day 21) compared to Time 3. PPO (M = 106.20, SD=19.3) and RPS (M=106.43, SD=18.7) scores indicated a relatively high level of adaptive problem-solving orientation while those indicating high levels of maladaptive problem-solving orientation also continued mostly unchanged: NPO mean of 101.36 (SD = 17.4), ICS mean of 100.15 (SD = 19.3) and AS mean of 99.89 (SD = 20.8). There was little difference between the intervention and control groups scores.

Responses to the SPSI-R:S at posthospital discharge day 28 (i.e., Time 5) were similar with those reported at earlier timepoints. The mean SPSI-R:S score (104.79, SD = 19.5) indicated adaptive problem-solving orientation was at a level above the midpoint of the scale. Scores on PPO (M = 106.42, SD = 19.2) and RPS (M = 106.43, SD = 18.7) were also largely unchanged compared to previous timepoints and indicated relatively high levels of adaptive problem-solving orientation. The responses for maladaptive problem-solving orientation also had negligible change from the previous measurements and were similar between intervention and control groups.

The scores on SPSI-R:S (M = 104.13, SD = 20.1), PPO (M = 105.46, SD = 18.1) and RPS (M = 105.42, SD = 17.2) at Time 6 (i.e., posthospital discharge day 42) were comparable to responses at previous timepoints and indicated higher levels of adaptative problem-solving orientation. The NPO (M = 101.85, SD = 17.8), ICS (M = 100.43, SD = 19.7) and AS (M = 99.92, SD = 20.8) scores indicated higher levels of maladaptive
problem-solving orientation and were unchanged compared to previous responses with close similarities between the intervention and control groups.

At Time 7 and the last timepoint (i.e., posthospital discharge day 56), SPSI-R:S scores remained comparatively unchanged throughout the study and indicated higher scores on adaptive problem-solving orientation styles: PPO ($M_I = 106.44, SD = 16.4$ vs. $M_C = 103.84, SD = 19.8$), $t(138) = -0.59, p = 1.69$; RPS ($M_I = 105.4, SD = 16.4$ vs. $M_C = 105.47, SD = 18.3$), $t(138) = 0.02, p = .98$). Maladaptive problem-solving orientation styles scores also remained unfavorably high throughout the study: ICS ($M_I = 97.09, SD = 17.3$ vs. $M_C = 103.44, SD = 21.3$), $t(138) = 1.93, p = .06$ and AS ($M_I = 97.49, SD = 16.9$ vs. $M_C = 101.65, SD = 23.2$), $t(138) = 1.2$, $p = .23$). There were no significant differences between the intervention and control group scores. Participants’ scores suggest that higher adaptive and maladaptive problem-solving orientation styles dually existed in this sample and remained unchanged throughout the seven timepoints.
Table 6

Health Outcomes: Perceived Preparation for Self-care

<table>
<thead>
<tr>
<th>Timepoint</th>
<th>Total Sample (N = 154) M/SD</th>
<th>Intervention (n = 76) M/SD</th>
<th>Control (n = 78) M/SD</th>
<th>Statistics</th>
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<td>Timepoint 1</td>
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<tr>
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<tr>
<td></td>
<td>48.84/32.4</td>
<td>49.92/30.1</td>
<td>47.76/34.7</td>
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</tr>
<tr>
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<td>41.6/34.3</td>
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</tr>
<tr>
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<td>48.56/28.9</td>
<td>60.47/21.1</td>
<td>36.65/30.8</td>
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</tr>
<tr>
<td>Timepoint 6</td>
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<td>Intervention (n = 71) M/SD</td>
<td>Control (n = 70) M/SD</td>
<td>Statistics</td>
</tr>
<tr>
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<td>47.5/27.3</td>
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<td>27.43/20.6</td>
<td>t = -12.67*</td>
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<tr>
<td>Timepoint 7</td>
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<td>Control (n = 68) M/SD</td>
<td>Statistics</td>
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<td>46.67/27.6</td>
<td>67.37/16.6</td>
<td>25.36/19</td>
<td>t = -13.81*</td>
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Notes. *p value <0.05.
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<th>Intervention (n = 76) M/SD</th>
<th>Control (n = 78) M/SD</th>
<th>Statistics</th>
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<td>5.17/1.7</td>
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<td>t = -.01</td>
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<td>5.46/1.4</td>
<td>5.01/1.7</td>
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*Table 7*

*Health Outcomes: Multidimensional Scale of Perceived Social Support*
### Table 8

*Health Outcomes: Multidimensional Scale of Perceived Social Support – Family Subscale*

<table>
<thead>
<tr>
<th></th>
<th>Total Sample (N = 154) M/SD</th>
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<th>Control (n = 78) M/SD</th>
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<td>5.33/2.4</td>
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<td>Total Sample (N = 142) M/SD</td>
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<td>Control (n = 71) M/SD</td>
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<td>5.4/2.4</td>
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<td><strong>Timepoint 5</strong></td>
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<td></td>
<td>Total Sample (N = 141) M/SD</td>
<td>Intervention (n = 71) M/SD</td>
<td>Control (n = 70) M/SD</td>
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<td>6.23/1.4</td>
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<td>Total Sample (N = 138) M/SD</td>
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<td><strong>Timepoint 7</strong></td>
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<td>6.22/1.4</td>
<td>5.34/2.4</td>
<td><em>t = -2.6</em></td>
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*Notes.* *p* value <0.05. *a* = MSPSS subscales significant other & friends had no significant *p* values
| Table 9  |
|-----------------|-----------------|-----------------|-----------------|
| **Health Outcomes: Social Problem-Solving Inventory: Revised-Short** |
|                           | Total Sample  
(\(N = 154\))  
\(M/SD\) | Intervention  
(\(n = 76\))  
\(M/SD\) | Control  
(\(n = 78\))  
\(M/SD\) | Statistics |
| Timepoint 1 | 104.63/19.4 | 106.21/17.2 | 103.1/21.4 | \(t = -1\) |
| Timepoint 2 | 104.28/19.4 | 106.28/17.3 | 102.1/21.1 | \(t = -1.3\) |
| Timepoint 3 | 104.55/19.7 | 106.86/17 | 102.24/21.9 | \(t = -1.4\) |
| Timepoint 4 | 104.58/19.7 | 106.93/17 | 102.24/21.9 | \(t = -1.43\) |
| Timepoint 5 | 104.79/19.5 | 107.34/16.6 | 102.24/21.9 | \(t = -1.57\) |
| Timepoint 6 | 104.13/20.1 | 106.82/17 | 101.4/22.6 | \(t = -1.61\) |
| Timepoint 7 | 104.25/20 | 107.1/16.6 | 101.35/22.6 | \(t = -1.69\) |

**Effects of the APN Intervention on Morbidity Outcomes**

**Primary Care Follow-up Visits**

Following hospital discharge, national guidelines from the American College of Cardiology (ACC), American Heart Association (AHA) and Heart Failure Society of America (HFSA) recommend HF patients receive follow-up care within 7-14 days with their primary care providers or cardiologists by clinic or a home visit intervention (Yancy et al. 2016). All participants enrolled in the study were contacted on posthospital discharge days 1, 7, 14, 21, 28, 42 and 56. Only a small portion of participants (\(N=31, 22\%\)) (Table 10) reported receiving follow-up care within the recommended 7-14 days.
The majority ($N = 93, 65.5\%$) of participants had no follow-up visits with their primary care providers, another portion ($N=40, 28.2\%$) had a single visit and only a small amount ($N=9, 6.3\%$) had more than one visit within the 8-weeks posthospital discharge period. Of those with primary care follow-up, the time to the first visit ranged from 1 to 56 days with a mean of 17.4 ($SD=11.1$). The primary care follow-up visit rates were similar for both groups ($M_I = 16.93, SD = 11.5 \ vs. \ M_C = 17.95, SD = 10.7$), $t(142) = .32, p = .75$.

**Cardiology Follow-up Visits**

Most participants ($N=107, 75.4\%$) denied receiving follow-up care with a cardiologist. A fifth of the participants ($N=31, 21.8\%$) (Table 10) had one visit with a cardiologist and a small number ($N=4, 2.6\%$) had two cardiology visits by 8 weeks months posthospital discharge. For participants that received cardiology visits, there was an average of 25 days to the first visit and ranged from 1 to 56 days. The participants’ cardiology follow-up rates were similar for intervention and control groups ($M_I = 26.24, SD = 13.1 \ vs. \ M_C = 23.15, SD = 14.3$), $t(142) = -.66, p = .51$.

**Home Health Agency Visits**

Participants discharged home with a continuous infusion of medicines intravenously required home health agency visits by registered nurses at least twice weekly to provide care for this type of medicine delivery. Eleven percent of the participants ($N=16$) received home health agency visits. Of those, the participants received 8 to 24 visits within the 2 months posthospital discharge with a mean number of visits of 16.25 ($SD=3.6$). There were no significant differences between the intervention and control groups by home health agency visits ($M_I=15.71, SD=4.7 \ vs. \ M_C=16.67, SD=2.8$), $t(142)= -.51, p=.62$.
Morbidity

All participants were contacted on posthospital discharge days 1, 7, 14, 21, 28, 42 and 56 and asked about healthcare use including emergency department/urgent care center visits or hospitalizations. As indicated in Table 10, overall, there were 36 emergency department visits (25.4%), and 35 hospitalizations (24.6%). The intervention group had fewer emergency department visits \((n = 12, 16.9\% \text{ vs. } n = 24, 33.8\%)\), and fewer hospitalizations \((n = 12, 16.9\% \text{ vs. } n = 23, 32.4\%)\), compared to the control group. The number of emergency department visits \((x^2 = 5.36, p = .02)\), and hospitalizations \((x^2 = 4.59, p = 0.03)\) between the groups were significant.

Morbidity Characteristics

Overall, a quarter of the sample had emergency department visits and hospitalizations. There was a negligible difference between rates of emergency visits (25.4%) and hospitalizations (24.6%); all hospitalizations resulted from visits to the emergency department. Of the participants that had hospitalizations, the majority \((N = 28, 80\%)\) reported worsening HF symptoms as the cause of their emergency department visit and remainders were due to noncardiac causes \((i.e.\) low blood sugar, bronchitis, pneumonia, stomach pain, vomiting blood\). Most hospitalizations \((N = 20, 57.1\%)\) occurred within the first 3 weeks posthospital discharge with another 14.3% by week 4, 11.4% by week 6 and 17.1% by week 8. There were no differences in the timing of hospitalization comparing the intervention and control groups \((FET = 3.25, p = .74)\).

While most hospitalized participants \((N = 25, 71.4\%)\) had a single hospitalization during the 8-weeks follow-up, some participants \((N = 6, 17.1\%)\) had 2 hospitalizations and
another subset \((N = 4, 11.4\%)\) had 3 hospitalizations. However, there was no difference in cumulative hospitalization length of stay in days for both groups \((M_I = 6.83, SD = vs. M_C = 7.78, SD = 4.9), t(142) = .55, p = 58\).

Table 10

<table>
<thead>
<tr>
<th>Health Outcomes: Posthospital Discharge Follow-up</th>
<th>Total Sample ((N = 142))</th>
<th>Intervention ((n = 71))</th>
<th>Control ((n = 71))</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine Healthcare Follow-up</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Day Follow-up Visit</td>
<td>31(22)</td>
<td>17(24)</td>
<td>14(20)</td>
<td>(\chi^2 = .37)</td>
</tr>
<tr>
<td>Lacking PCP Visit</td>
<td>93(63.4)</td>
<td>43(60.6)</td>
<td>50(70.4)</td>
<td>FET = .41</td>
</tr>
<tr>
<td>1 PCP Visit</td>
<td>40(28.2)</td>
<td>22(31)</td>
<td>18(25.4)</td>
<td></td>
</tr>
<tr>
<td>2 PCP Visits</td>
<td>9(6.3)</td>
<td>6(8.4)</td>
<td>3(4.2)</td>
<td></td>
</tr>
<tr>
<td>Cardiology Follow-up</td>
<td>35(24.6)</td>
<td>21(29.6)</td>
<td>14(19.7)</td>
<td>(\chi^2 = 1.86)</td>
</tr>
<tr>
<td>Lacking Cardiology Visits</td>
<td>107(75.4)</td>
<td>50(70.4)</td>
<td>57(80.3)</td>
<td>FET = .36</td>
</tr>
<tr>
<td>1 Cardiology Visit</td>
<td>31(21.8)</td>
<td>19(26.8)</td>
<td>12(16.9)</td>
<td>(\chi^2 = .36)</td>
</tr>
<tr>
<td>2 or Cardiology Visits</td>
<td>4(2.6)</td>
<td>2(2.8)</td>
<td>2(2.8)</td>
<td>(\chi^2 = .36)</td>
</tr>
<tr>
<td>Home Health Agency Visits</td>
<td>16(11.3)</td>
<td>7(9.8)</td>
<td>9(12.7)</td>
<td>(\chi^2 = .28)</td>
</tr>
<tr>
<td>Emergency Department</td>
<td>36(25.4)</td>
<td>12(16.9)</td>
<td>24(33.8)</td>
<td>(\chi^2 = 5.36^*)</td>
</tr>
<tr>
<td>Hospital Readmission</td>
<td>35(24.6)</td>
<td>12(16.9)</td>
<td>23(32.4)</td>
<td>(\chi^2 = 4.59^*)</td>
</tr>
</tbody>
</table>

Notes. *p value <0.05. FET = Fisher’s exact test. PCP = primary care provider.
Heart Failure Features and Morbidity

The New York Heart Association (NYHA) classification uses four sets (class I-IV) to represent the degree of symptomatic limitation of HF manifesting as undue fatigue, palpitation, breathlessness, or angina chest pain (American Heart Association, 2017). NYHA Class I patients have no limitations. Class II patients have slight limitation of physical activity. NYHA class III patients have marked limitation of physical activity; they are comfortable at rest but less than ordinary activity produces symptoms. Patients with NYHA class IV are most severely symptomatic, they are unable to perform any physical activity without discomfort with symptoms present even at rest and undertaking any physical activity increases discomfort (Reisfield & Wilson, 2005).

In this study, all participants had substantial HF limitations (Table 4) with symptom classes as follows: NYHA class II with $n = 48$, 31.2%, NYHA class III with $n = 65$, 42.2%, NYHA class IV with $n = 41$, 26.6% and their randomization to control and intervention groups was similar (Table 4). Of participants with hospitalization during the 8-weeks follow-up, NYHA class IV accounted for the largest subset ($n = 18$, 51.4%) compared to NYHA III ($n = 12$, 19.4%) or NYHA II ($n = 5$, 11.1%). Using Fisher’s Exact Test, results indicated fewer participants with NYHA class IV had hospitalization in the intervention group compared to the control group ($n_I = 2$, 12.5% vs. $n_C = 16$, 84.2%), $FET = 13.55$, $p < .001$). This difference was significant.

Effects of the APN Intervention on Healthcare Charges

Data for emergency department visits, hospitalizations and home health agencies were obtained from medical records at Jackson Health System and by asking participants for the number of encounters for healthcare services at other facilities. Due to variations
among facilities, charges reported in the literature were used: primary care, cardiology and copay (Machlin & Mitchell, 2018), emergency visit (Dahlen, 2020), hospitalization and home health agency (Blum et al., 2020), and APN wages (U.S. Bureau of Labor Statistics, 2020). Twenty eight participants received health services at the Jackson Health System (emergency department, \( n = 28 \), hospitalizations, \( n = 27 \)). The participants who received healthcare services elsewhere were contacted by telephone and asked about the number of these encounters. Participants received the following services (emergency department, \( n = 8 \), hospitalization, \( n = 8 \), home health agency, \( n = 16 \)).

The mean healthcare charge (Table 11) for the intervention group was significantly lower (\( M_I = $3,124, SD = $6,413 \) vs. \( M_C = $6,897, SD = $11,268 \), \( t(142) = 2.45, p = .02 \)) than that of the control group. Compared to the control group, the intervention group had lower mean charges for: emergency department visit (\( M_I = $1,370, SD = $496, \) range $1,096 - $2,192 vs. \( M_C = $1,644, SD = $855, \) range $1,096 - $3,288); hospitalization (\( M_I = $14,689, SD = $4,901, \) range $12,591 - $25,182 vs. \( M_C = $18,162, SD = $9,950, \) range $12,591 - $37,773); and home health agency (\( M_I = $1,192, SD = $355, \) range $607 - $1,214 vs. \( M_C = $1,264, SD = $215, \) range $1,062 - $1,214).

However, the control group had lower mean charges for primary care provider visits (\( M_I = $226, SD = $78, \) range $186 - $372 vs. \( M_C = $213, SD = $67, \) range $186 - $372); cardiologist visits (\( M_I = $367, SD = $101, \) range $335 - $670 vs. \( M_C = $383, SD = $122, \) range $335 - $670); and clinic copay (\( M_I = $35, SD = $12, \) range $25 - $50 vs. \( M_C = $34, SD = $12, \) range $25 - $50).

The intervention group received additional APN telephone call charges which the control group did not receive. The APN practice time was calculated to cost $56.63 per
hour ($117,808/year). This amount was based on the average fulltime salary plus benefits for APNs (i.e., Cardiology or Hospitalist) working in South Florida as reported by U.S. Bureau of Labor Statistics (BLS, 2020) data base. The hourly rate was calculated by dividing the annual salary and benefits by 52 weeks and again by dividing by 40 hours/week.

The total mean charge for APN telephone calls for the intervention group was $75 per participant with a total charge of $5,347 (SD = $9.60). Overall, the total intervention group charges of $221,786 were significantly lower ($t(142) = 2.45, p = .02) compared to the control group’s total healthcare charges of $490,115. Charges for the intervention group were $268,329 lower than the control group. Measured over the control group’s cost of $490,115, this represents a 56.8% reduction in charges for the intervention group compared to the control group.
Table 11

<table>
<thead>
<tr>
<th></th>
<th>Total Charge T$/ M$</th>
<th>Intervention T$/ M$</th>
<th>Control T$/ M$</th>
<th>Group Difference</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Care Visit</td>
<td>$10,788/$220</td>
<td>$6,324/$226</td>
<td>$4,464/$213</td>
<td>$1,860</td>
<td>.53</td>
</tr>
<tr>
<td>Cardiologist Visit</td>
<td>$13,065/$373</td>
<td>$7,705/$367</td>
<td>$5,360/$383</td>
<td>$2,345</td>
<td>.68</td>
</tr>
<tr>
<td>Home Health Agency</td>
<td>$19,728/$1,233</td>
<td>$8,346/$1,192</td>
<td>$11,382/1,264</td>
<td>$3,036</td>
<td>.62</td>
</tr>
<tr>
<td>Emergency Department</td>
<td>$55,896/$1,553</td>
<td>$16,440/1,370</td>
<td>$39,456/1,644</td>
<td>$23,016</td>
<td>.23</td>
</tr>
<tr>
<td>Hospitalization</td>
<td>$604,368/$17,268</td>
<td>$176,274/$14,689</td>
<td>$428,094/$18,162</td>
<td>$251,820</td>
<td>.13</td>
</tr>
<tr>
<td>APN</td>
<td>$5,347/$75</td>
<td>$5,347/$75</td>
<td>N/A</td>
<td>$5,347</td>
<td></td>
</tr>
<tr>
<td>Clinic Copay</td>
<td>$2,275/$34</td>
<td>$1,350/$35</td>
<td>$925/$34</td>
<td>$425</td>
<td>.91</td>
</tr>
<tr>
<td>Totals</td>
<td>$711,467/$5,010</td>
<td>$221,786/$3,124</td>
<td>$490,115/$6,897</td>
<td>$268,329</td>
<td>.02*</td>
</tr>
</tbody>
</table>

Notes. *p value <0.05.

**Summary**

Study findings indicate that intervention group participants benefited from the APN follow-up telephone calls as reflected in health outcomes and healthcare charges. Intervention group participants had a substantially higher rating of perceived preparation for self-care by a month posthospital discharge that continued to improve by the end of the 8-weeks follow-up compared to control group participants whose ratings of perceived preparation for self-care worsened overtime.
Participants in the intervention group had significantly fewer emergency department visits and hospitalizations than the control group. The intervention groups’ healthcare charges were significantly lower compared to the control group $221,786/$3,124 vs. $490,115/$6,897 even after including the APN telephone charges to the intervention group total charges.

These study results indicate that an intervention of APN follow-up telephone calls in this sample of adults diagnosed with HF was an effective, safe, low cost, easy to apply intervention which improved health outcomes and reduced healthcare charges.
CHAPTER V.

DISCUSSION

Studies examining perceived preparation for self-care in adults diagnosed with heart failure (HF) and who carry heavy symptom burdens are very limited. With high a 30-day hospital readmission rate and the high costs for HF care, research has been focused on healthcare facility processes (Bradley et al., 2013). Consistent with these issues, this sample of multietnic, low income adults with moderate to severe HF symptoms mostly lacked follow-up with their providers at 8 weeks posthospital discharge. Overall, they had high hospitalization rates and high healthcare charges. Despite receiving limited follow-up with providers, the intervention group that received a low-cost advanced practice nurse (APN) intervention more favorably perceived preparation for self-care and had fewer emergency department visits and hospitalizations than the control group. In addition, the intervention group benefited from substantial savings from reduced use of healthcare services. This chapter compares the present study findings with those of other research in this area.

Intervention and Samples

In this study, ages ranged from 29 to 91 with an average age of 66 years. Most were men, unpartnered, low income with Hispanic ethnicity and had at least high school education. This profile is consistent with the demographic profile of residents living in South Florida with heart disease (America’s Health Rankings, 2018). Other APN follow-up studies with participants diagnosed with HF have been conducted but with different sample characteristics and study interventions. In a classic trial, Naylor team (2004) with a sample of mostly White elders diagnosed with HF examined health outcomes and costs
in a 12-month follow-up study. Three APNs in the study provided direct care, used inpatient care delivery, home visits, as well as telephone follow-up. Results indicated better outcomes and lower costs in elders that received APN interventions compared to the control group that did not receive APN interventions. In another trial, Coleman team (2006) used an APN to provide coaching interventions during home visits and telephone follow-up to a sample of majority White elders with a variety of diagnoses including HF in a 1-month follow-up study. Compared to the control group that did not receive APN interventions, findings indicated improved health and cost outcomes in the intervention group.

Telephone follow-up as a singular intervention was rarely used in research. It was mainly combined with other interventions such as home visits, HF education or telecare that featured electronic health information transmission (Feltner et al., 2014). In a report of a meta-analysis of studies with adults diagnosed with HF by Feltner et al. (2014), it was suggested that telephone follow-up was unsuccessful in reducing hospital readmission rates. However, the interventionists in those studies with telephone follow-up as a singular intervention were not APNs. Gorodeski, Chlad and Vilensky (2013) suggested that key components of the intervention’s effectiveness were the involvement of providers such as APNs who can make therapeutic decisions in real time and avoid the delay of waiting for other prescribing providers. Following decades of follow-up studies with vulnerable populations at high risk for rehospitalization, Brooten team (2003) also suggested a dose of APN time and contact makes a difference in improving health outcomes and reducing healthcare costs. Consequently, this study built on previous
research by using APN services to intensify the telephone follow-up intervention and targeted participants’ perceptions of their preparation for self-care.

**Health Outcomes**

**Perceived Preparation for Self-care**

National HF guidelines recommend posthospital discharge follow-up within 7-14 days to improve health outcomes (Yancy et al., 2016). In this study the majority of participants lacked a follow-up with their providers by the recommended time. Little or no reports were found describing serial measurements of *Care Transitions Measure* (*CTM*®-*15) scores in the posthospital discharge period. Using the *CTM*®-*15* that measures perceptions of preparation for HF self-care, on posthospital discharge day 1, overall participants had high scores on *CTM*®-*15* indicating favorable perceptions of preparation to perform self-care on all subscales including: (1) inpatient - identify staff inclusion of patient preferences in discharge planning, (2) at-discharge - check for patient’s awareness of self-care behaviors, (3) follow-up – check for clear follow-up schedule and (4) medications – check’s patient knowledge of medication purpose administration and side effects. This finding is consistent with other reports of previous studies indicating participants were likely to have favorably perceived preparation for self-care around the immediate time of hospital discharge (Coleman et al., 2006; Bakshi et al., 2012; Goldstein et al., 2016). By posthospital discharge day 7, in the current study, *CTM*®-*15* scores were somewhat reduced for intervention and controls groups suggesting their perceived preparation for self-care was less favorably as the number of days posthospital discharge increased. The *CTM*®-*15* scores were substantially reduced by posthospital discharge day 14 and indicated overall poor perceived preparation for
self-care for both groups. It is important to note that by this timepoint, the study lost 12 participants (8%) who had deterioration of their condition and were admitted to skilled nursing facilities or died; 5 from the intervention group and 7 from the control group. This finding underscores the fact that issues faced by HF patients posthospital discharge may overwhelm their ability to perform self-care peaking by 14 days posthospital discharge. Altfeld et al. (2012) suggest this finding reflects participants’ issues with communication failure between providers across sites, unintended medication discrepancies or issues understanding rationale for treatments. In addition, this finding lends support to national guidelines that recommend early follow-up to reduce high risks of hospitalization 7 to 30 days posthospital discharge (Yancy et al., 2016).

By posthospital discharge day 21 in the current study, while the overall CTM®-15 scores remained low, indicating overall poor perceived preparation for discharge, the intervention group had an insignificant increase in their mean score compared to the control group. However, at posthospital discharge day 28, there was a significant difference between the mean CTM®-15 scores of the intervention group that further increased compared to the control group with scores that further decreased. There were significant differences between the means on the four subscales. This finding suggests the APN intervention’s effect made a significant difference in perceived preparation for self-care within 30 days of hospital discharge.

For posthospital discharge days 42 and 56, the trend continued with increasing CTM®-15 mean scores for the intervention group and decreasing mean scores for the control group. At the end of 8-weeks posthospital discharge follow-up, the intervention group CTM®-15 mean score indicated relatively high perceived preparation for self-care
while the $CTM^{®}-15$ mean score of the control group was very low indicating poor perceived preparation for self-care. Therefore, beginning at posthospital discharge day 28 to the end of the 8-week follow-up, there were significant differences in mean $CTM^{®}-15$ scores between the groups indicating the intervention group had more favorable perceptions of preparation for self-care compared to the control group that did not have an APN follow-up intervention. Serial measurements of $CTM^{®}-15$ scores used in this study contribute important data to HF posthospital discharge care. With this sample, serial measurements indicate less favorable perceptions of preparation for self-care overtime that reached a low by posthospital discharge day 14 and successfully responded to an APN follow-up intervention by posthospital discharge day 28.

**Perceived Social Support**

Research indicates adequate social support improved HF patients’ self-care performance (Graven & Grant, 2014; Gallagher, Luttik & Jaarsma, 2011; Salyer, Schubert & Chiaranai, 2012). In a cross-sectional study, Gallagher team (2011) examined social support with a sample of adults diagnosed with HF and found participants with high levels of social support were more likely to consult with health professionals for weight gain, fluids consumed, adherence to medication regimens, immunizations and exercise compared to those with medium to low levels of social support. In the current study of mostly unpartnered men of Hispanic and Black ethnicity, there were high levels of perceived social support as measured by the *Multidimensional Scale of Perceived Social Support (MSPSS)*. Examining the instrument’s three subscales (*i.e.* significant other, family, friends), this sample perceived the highest level of social support from their families. In addition, as displayed in Table 8, from baseline to the end
of 8-weeks follow-up, the intervention group perceived a significantly higher level of social support from their families compared to the control group. Most participants reported having a support person and nearing half of the sample reported receiving social support from their children. The intervention and control groups were similar in perceiving high levels of social support that remained largely unchanged at all seven timepoints during the 8-weeks follow-up. Based on previous studies (Gallagher, Luttik & Jaarsma, 2011; Salyer, Schubert & Chiaranai, 2012), indicating that a high level of perceived social support has a positive relationship with HF self-care performance, it is reasonable that in this study having a social support person positively contributed to health outcomes overall. Furthermore, the success of the APN intervention likely resulted from the participant’s enhanced perceptions of support as well as tangible support they received from their families. Future investigations of similar duration may not require serial measurements of social support unless drastic changes in social support are anticipated.

**Problem-solving**

HF patients who fail to recognize and act when symptoms worsen have poor health outcomes including early rehospitalization and death (Albert et al., 2015). A variety of variables have been suggested as determinants that contribute to these poor health outcomes. Uchmanowicz et al. (2015) examined frailty syndrome, a multidimensional state in which individuals’ experience of loss in one or more domains of human functioning (physical, psychological, social) increases the risk of adverse outcomes. Findings indicated that frailty was associated with advancing age, lower education, longer duration of HF, higher number of hospitalizations and greater severity
of HF symptoms. These findings were supported by a meta-analysis conducted by Denfeld team (2017) including 6,896 elders diagnosed with HF. They reported a prevalence of 44.5% of frailty syndrome in their sample. However, Denfeld team (2017) did not find a significant relationship between frailty syndrome and participant age or HF symptom severity.

An integrative literature review of 23 qualitative and quantitative studies investigating HF self-care was conducted by Falk et al. (2013). Results indicated that participants had poor health literacy about their condition. However, with increased health literacy, knowledge increased but self-care performance did not improve. The authors concluded that the many ways in which high risk populations cope with HF is determined by how they understand their illness. Other researchers (Lewis et al., 2015) examining poor health outcomes in a 2.4-year follow-up study reported that compared to Whites, Black and Hispanic North Americans had poorer health outcomes despite having similar access to care. The researchers suggested that results might have been affected by the difficult to measure variables such as characteristics that encompass social behaviors and norms including mistrust in healthcare systems, health literacy and maladaptive coping mechanisms.

Coping and problem solving were examined in a study by Graven, Grant and Gordon (2015) with elders diagnosed with HF. They used a cross-sectional predictive design to examine the effect of coping, social problem-solving, among other variables on HF self-care behaviors. The Social Problem-Solving Inventory Revised-Short (SPSIR-S), a 25-item survey was used to measure social problem-solving orientation and problem-
solving styles. Adaptive problem-solving is indicated by higher scores on positive problem orientation (PPO) and rational problem-solving style (RPS) subscales. While lower scores on negative problem orientation (NPO), impulsive/careless style (ICS), and avoidance style (AS) indicate adaptive problem-solving. Findings indicated a greater than average score on all five subscales of the SPSIR-S.

In the current study, participants responded to the SPSIR-S to measure adaptive and maladaptive problem-solving orientation and three problem-solving styles (rational, impulsive/careless and avoidance). Serial measurements were collected at seven timepoints during the 8-weeks posthospital discharge period. Similar to the results of Graven et al. (2015), overall SPSIR-S scores were higher than the midpoint of the scales on adaptive orientation indicating a high level of adaptive problem-solving orientation. Also similar to results reported by Graven et al. (2015), overall scores were also higher than the midpoint of the scales on the maladaptive problem-solving styles indicating high levels of maladaptive problem-solving. Mean SPSIR-S scores were similar for the intervention and the control groups. In addition, there was little or no change in these scores throughout the 8-week follow-up. Thus, participants’ SPSIR-S scores suggest that greater than average adaptive and maladaptive problem-solving orientation styles were dually occurring in this sample and these scores remained unchanged throughout the seven timepoints. Self-reporting biases may play a role in the contradiction of having a high level of adaptive problem-solving dually occurring with a high level of maladaptive problem-solving. An example was an incident retold by a participant in the current study. The participant had agreed with his care team to complete a 6-minute walk test with a physical therapist prior to discharge. On the day of discharge, he became upset and felt
he was being disrespected when he had to wait for the arrival of the physical therapist. He then left the hospital against medical advice, even leaving his prescriptions and discharge packet. Yet when he completed the study instruments including the SPSIR-S, he selected responses that indicate a high level of adaptive problem-solving orientation.

The contradiction of having a high level of adaptive problem-solving dually occurring with a high level of maladaptive problem-solving can be best explained by results of a study reported by Dickson et al. (2013). They used a mixed methods cross-sectional designed study with Black Americans to examine variables that influence HF self-care decision making. Themes that emerged suggested participants had difficulty reconciling cultural beliefs with HF self-care. A diagnosis of HF was less concerning than a diagnosis of cancer. HF development was believed to be inevitable or attributed to stress. In addition, Dickson et al. (2013) reported that responses indicated that HF self-care and health outcomes were linked to spirituality (‘‘the doctor may order it, but I pray on it’’). Taken together, these data suggest that coping and problem-solving with HF self-care is complex. There may be many competing variables that impact failure to recognize and act when symptoms worsen resulting in poor health outcomes. Some of these variables are yet to be explained.

Since the SPSIR-S scores in the present study were similar in the intervention and control groups and did not change overtime, no claims can be made about the impact of APN interventions on coping and problem-solving. Further, future investigations of similar duration may not require serial measurements of coping and problem-solving.
Routine Healthcare Follow-up

Research indicates that early and frequent contact with healthcare providers posthospital discharge helps to bridge gaps in care delivery and improve HF health outcomes. For decades national guidelines have recommended posthospital discharge follow-up within 24 - 48 hours by telephone and within 7-14 days by clinic or home visit intervention (Yancy et al. 2016). Despite these guideline recommendations, Altfeld et al. (2012) reported many issues with communication failure between providers across sites. Consistent with these findings, in the present study, only a fifth of the sample received clinic follow-up within the recommended 7 - 14 days posthospital discharge. Two thirds of participants lacked follow-up with their primary care providers and three fourths lacked follow-up with cardiologists. Only a minority of participants received clinic follow-up appointments posthospital discharge. The rate of clinic follow-up was similar for the intervention and control groups. Important issues surfaced as barriers to clinic follow-up care. Participants indicated that their community providers were unaware that hospitalization had occurred and therefore were not alerted to the need for posthospital follow-up. Often by the time appointments became available with these providers, rehospitalization had occurred again. Other participants had difficulty scheduling appointments with their providers due to insurance administrative issues. Participants who received funding through Miami-Dade County safety net programs needed to attend a finance appointment prior to being able to schedule a clinic appointment.

In this study, home health agency visits were used only for the few participants discharged home with a continuous infusion of medicine intravenously. The home health agency registered nurses mainly provided care for this type of medicine delivery. There
were no differences between the number of intervention and control group participants receiving home health visits. Overall, the sample was disadvantaged by the low rate of follow-up by their community care providers placing them at high risk for use of emergency department and rehospitalization. A quarter of the sample had rehospitalization, a rate higher than the national average of a little over 20%. However, the intervention group had about half as many rehospitalizations compared to the control group. Because overall the participants were severely lacking in follow-up care, it helps to explain the strength of the APN telephone follow-up intervention.

**Morbidity**

In this study, APN follow-up telephone calls effectively reduced rates of emergency department visits and rehospitalizations in the intervention group compared to the control group that did not receive the intervention. Most hospitalizations overall occurred within the first 3 weeks posthospital discharge. With no difference in the timing of hospitalization comparing the intervention and control groups, the data support previous research indicating that the first 30 days posthospital discharge is the most vulnerable time for poor health outcomes. This time period warrants intensification of posthospital discharge interventions. Further, the APN intervention in this study was most impactful in posthospital discharge weeks 3 through 8 corresponding with an accumulative dose of APN time.

**Healthcare Charges**

Healthcare charges are difficult to compare with other research findings because medical facilities in different states have different charges for the same services. In addition, facilities within the same state have different charges for the same services.
Although most participants in the present study received emergency department and hospital care at Jackson Health System, others sought services at a number of medical facilities elsewhere, some public, some private. These facilities, offering the same services, often have different charges with the private medical facility charging more for the same service compared to Jackson Health System’s Miami-Dade County public facilities. Additionally, different facilities had different length of stays for a similar diagnosis which has an enormous effect on the amount charged. In the current study, charges reported in the literature that represents national averages per episode were used: $106 for primary care visit, $335 for cardiology visit and $25 for clinic copay (Machlin & Mitchell, 2018), $1,096 for emergency department visit (Dahlen, 2020), $12,591 for hospitalization, $1,214 per home health agency episode (Blum et al., 2020), and $56.64 for APN hourly wages (U.S. Bureau of Labor Statistics, 2020).

In this study, there were similar mean charges for primary care provider and cardiology visits, clinic copays and home health agency episodes. The mean emergency department charge was $1,553 and the mean rehospitalization charge was $17,268. The intervention group had a lower mean emergency department visit charge ($M_I = 1,370, SD = 496$, range $1,096 - 2,192$ vs. $M_C = 1,644, SD = 855$, range $1,096 - 3,288$) and a lower mean hospitalization charge ($M_I = 14,689, SD = 4,901$, range $12,591 - 25,182$ vs. $M_C = 18,162, SD = 9,950$, range $12,591 - 37,773$) compared to the control group. Consistent with the literature, in this sample, nearly all emergency department visits resulted in rehospitalizations. The intervention group had about half as many rehospitalizations compared to the control group. The total intervention group charges of $221,786 were significantly lower ($t(142) = 2.45, p = .02$) compared to the
control group’s total healthcare charges of $490,115. Charges for the intervention group were $268,329 lower than the control group. Measured over the control group’s cost of $490,115, this represents a 56.8% reduction in charges for the intervention group compared to the control group. With this sample, APN follow-up applied to the intervention group successfully reduced healthcare charges compared to the control group that did not receive APN interventions. Charges reported in previous studies are comparable to this study’s findings especially when the increased costs of healthcare over the ensuing years are taken into consideration.

**APN Charges**

According to the literature, APN follow-up interventions have been shown to improve HF health outcomes and decrease healthcare costs. In the Naylor team (2004) 12-month study with 239 elders diagnosed with HF using APN home visits and telephone follow-up calls, intervention group total charges were $823,397 versus $1,548,619 for the control group. APN follow-up charges for home visits and telephone calls averaged $24.50 per participant per month. In Coleman team (2006) 1-month study of elders with mixed diagnoses including HF, the average APN charge for home visits and telephone follow-up calls was $221 per participant per month.

In the present study, the intervention group had significantly lower healthcare charges (Total: $221,786, \( M = $3,124 \)), compared to the control group (Total: $490,115, \( M = $6,897 \)). The average APN telephone call charge was only $0.26 per participant per month with a total charge of $5,347 for the intervention group participants. Study findings are consistent with those of Naylor et al. (2004) and Coleman et al. (2006) where the mean charge per participant per month was higher due to other study’s use of home
visits. Study results indicated that APN telephone follow-up care is an effective and less expensive alternative to home visits in providing follow-up care in the home with adults diagnosed with HF posthospital discharge.

**Limitations of the Study**

All participant responses in this study were limited by self-reporting biases. It is not known if the study findings would remain if the APNs were part of the participant’s care team or if all health information were collected from the participant’s medical records. Data collection was limited to one healthcare system. Generalizability of these findings may not apply to other settings.

**Implications**

The healthcare system has changed drastically over the years. Hospital lengths of stay have shortened and HF patients require complex care in the posthospital discharge period leaving them vulnerable to lapse in care. When their capacity to provide self-care gets overwhelmed, they disproportionately use high-cost healthcare services of emergency care and rehospitalization. The novel use of serial measurements of perceived preparation for self-care used in this study contribute important data to HF posthospital discharge care. With this sample, these serial measurements indicate less favorable perceptions of preparation for self-care overtime that reached a low by posthospital discharge day 14 and successfully responded to a low-cost APN follow-up intervention by posthospital discharge day 28. The first 3 weeks posthospital discharge was the time most vulnerable to poor outcomes including deteriorating health, rehospitalization and death. Intensification of APN interventions during this time could further improve health and cost outcomes. Such benefits would be especially important in this time when federal
legislation financially penalizes hospitals for 30-day readmissions. Much of today’s research was contributed by hospitalized HF patients that participated in HF disease registries. Less is known about HF patients living in the community. This study helps to fill the gap.

**Clinical Nursing**

There is a high hospitalization rate with over 20% of HF patients in the U.S. rehospitalized within 30 days of hospital discharge. National attention has been focused on practice models that reduce healthcare delivery inadequacies in the inpatient setting. However, HF patients experience gaps in care when transferring healthcare delivery from the hospital to the community. In the current study, only a small portion of the participants received follow-up care with their providers within 14 days posthospital discharge as recommended by national HF guidelines. However, these results may not be applicable to other locations or other HF patients. APNs are uniquely positioned to initiate and conduct follow-up interventions aimed at providing continuity of care including APN telephone follow-up.

In this study, participants in the intervention group had significantly lower healthcare charges, and fewer emergency department visits and rehospitalizations compared to the control group. These findings highlight the ability of APN to apply low-cost, easy to apply follow-up interventions to vulnerable populations especially during times of major budget cuts that affect healthcare services. Results provide healthcare professionals a better understanding of HF patients most critical timepoints of their perceptions of self-care from hospital discharge up to 60 days. A time highest in mortality and morbidity for these patients. These data are important to develop
interventions for improved health outcomes for this high risk population. Study findings may also provide data that will inform health policy.

**Future Research**

Findings from this study have provided valuable information on the effects of APN telephone follow-up care on this vulnerable population. Findings indicated that follow-up APN telephone calls had a significant effect on healthcare charges and a significant effect on health outcomes in a sample of mostly unpartnered men of Hispanic and Black ethnicity posthospital discharge with a diagnosis of HF. The intervention group benefitted from higher levels of perceived social support from their families. This enhanced perception of support as well as tangible support they received from their families likely resulted in the success of the APN telephone follow-up intervention. These findings are significant but the APN intervention could be intensified if the APN was a part of the patient’s care team. Many administrative issues that create barriers to clinic follow-up care could be addressed by an APN embedded in the care team. Future research could target APN interventions according to levels of family support and severity of HF symptoms and intensify APN interventions in the first 3 weeks posthospital discharge.

In this sample, there were high levels of adaptive problem-solving styles dually existing with high levels of maladaptive problem-solving styles. There may be competing variables that impact problem-solving that leads to poor health outcomes in HF self-care. Future research to explain these variables are needed. A subset of participants had deterioration of their symptoms unrelated to study procedures and required skilled nursing home care or died. This attrition group had a higher number of
hospitalizations in the previous 24 months. Research is needed to examine those most vulnerable for deterioration posthospital discharge.

Future research with variations on the intervention might include web-based technology with participants emailing, texting or video interacting with the APN within the 1st 3 days posthospital discharge.

**Summary**

The purpose of this randomized controlled trial was to examine the effects of APN follow-up telephone calls on adults discharged with a diagnosis of HF. Results of this study indicate that APN follow-up telephone calls had a significant effect on outcomes and a decrease in healthcare charges. Participants in the intervention group had significantly higher levels of perception of preparation to perform self-care and higher levels of perceived social support from their families. Outcomes for intervention group included fewer emergency department visits and rehospitalizations compared to control the group. Additionally, healthcare charges for intervention group were significantly lower, $221,786 compared to control group charges of $490,115. Study findings indicate that the low-cost, easy to apply, APN telephone follow-up intervention significantly improved health outcomes, and resulted in lower healthcare charges in this sample.
References


October 10, 2019

Valrie Reid  
9201 SW 150th Street  
Miami, FL 33176

Dear Ms. Reid:

The JHS Clinical Research Review Committee (CRRC) reviewed the study referenced below on October 02, 2019. This doctoral dissertation project is now approved and may commence at Jackson Health System.

<table>
<thead>
<tr>
<th>FIU IRB Protocol Number:</th>
<th>IRB-19-0182</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIU Principal Investigator:</td>
<td>Jean Hannan, PhD., APRN</td>
</tr>
<tr>
<td>JHS Site Investigator:</td>
<td>Valrie Reid, APRN</td>
</tr>
</tbody>
</table>
| Department: | Florida International University  
- Nicole Wertheim College of Nursing and Health Sciences  
- Jackson Health System  
- Miami Transplant Institute |
| Study Title: | Heart Failure Patients’ Perceptions of Preparation for Self-Care |
| Type of Study: | Survey/Interview |
| Funding: | Heart Failure Society of America |
| ClinicalTrials.gov Identifier: | N/A |
| Enrollment Target: | 154 Participants |
The CRRC has waived the administrative fee for this nursing dissertation project.

**JHS Office of Research requirements during the course of the study:**

- *As per JHS Policy (attached), signed Informed Consents MUST be sent to the JHS Office of Research by next business day.*
- *The Patient Enrollment Monthly Report (attached) must be submitted to the JHS Office of Research on a timely basis.*

This study must be conducted in accordance with the JHS approval.

Thank you for working with the JHS Office of Research.

**Marjorie A. Paterson, CMA, MBA, EA.**
Clinical Trials Coordinator/Auditor
Tel: (305) 585-7226 # 1/ (305) 585-7196
Email: marjorie.paterson@jhsmiami.org
Demographic Information – TO BE COLLECTED AT HOSPITAL DISCHARGE

Telephone Number_________________    Alternate Contact Number_________________________

Mailing Address: _________________________________

1_______ Language
   1. English
   2. Spanish
   3. Bi-lingual

2_______ Age       3_______ Gender       4_____ Duration of HF diagnosis (years)    5_______ NYHA class  
   I-IV

6_______ Marital Status
   1. Single never married
   2. Married
   3. Separated or divorced
   4. Widowed

7_______ Number of years with spouse/partner

8_______ Who is your support person?

9_______ Who are you living with now?

10______ Employment status       11____________________ Occupation
   1. Employed full time
   2. Employed part time
   3. Not employed

12_______ Race/ethnicity—youself identified group:
   1. African American Black
   2. Black-other
   3. Haitian
   4. Hispanic
   5. Non-Hispanic white
   6. Other

13_______ Educational level--- highest level completed
   1. less than high school
   2. high school (completed)
   3. Some post secondary education/ Associate Degree
   4. Bachelor’s Degree
   5. Graduate Degree

14_______ Annual Family Income from all sources
   1. < than $10,000
   2. $10,000 - $19,999
   3. $20,000 - $29,999
   4. $30,000 – $39,999
   5. $40,000 - $49,999
   6. $50,000 - $59,000
   7. $60,000 - $69,000
   8. $70,000 - $79,000
   9. $80,000 and above
   10. I choose not to answer

15_______ Type of medical coverage?
   10. I choose not to answer
**Time Point: Post Hospital Discharge**
Day 1, 7, 14, 21, 28, 35, 42, 56

<table>
<thead>
<tr>
<th>Participant Morbidity Data</th>
<th>Post hospital discharge day through 8 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participant Data</strong></td>
<td></td>
</tr>
<tr>
<td>Post hospital D/C follow-up care by Primary care provider visit?</td>
<td>Post hospital D/C follow-up care by Cardiologist visit?</td>
</tr>
<tr>
<td>1= yes  0 = no</td>
<td>1= yes  0 = no</td>
</tr>
<tr>
<td>If yes: How many days posthospital D/C</td>
<td>If yes: How many days posthospital D/C</td>
</tr>
<tr>
<td>1= yes  0 = no</td>
<td>1= yes  0 = no</td>
</tr>
<tr>
<td>Post hospital D/C follow-up care by any provider visit?</td>
<td>Post hospital D/C follow-up care by home health agency?</td>
</tr>
<tr>
<td>1= yes  0 = no</td>
<td>1= yes  0 = no</td>
</tr>
<tr>
<td>If yes: How many days posthospital D/C</td>
<td>If yes: How many days posthospital D/C</td>
</tr>
<tr>
<td>1= yes  0 = no</td>
<td>1= yes  0 = no</td>
</tr>
<tr>
<td><strong>Hospitalizations</strong> 1= yes  0 = no</td>
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</tr>
<tr>
<td>If yes, how many________</td>
<td></td>
</tr>
<tr>
<td>If Yes Diagnosis________</td>
<td></td>
</tr>
<tr>
<td>LOS (in days) __________</td>
<td></td>
</tr>
<tr>
<td>Charges________________</td>
<td></td>
</tr>
<tr>
<td><strong>ER Visits</strong> 1= yes  0 = no</td>
<td></td>
</tr>
<tr>
<td>If yes, how many________</td>
<td></td>
</tr>
<tr>
<td>If Yes Diagnosis________</td>
<td></td>
</tr>
<tr>
<td>Charges________________</td>
<td></td>
</tr>
<tr>
<td><strong>Acute Care Visits</strong> 1= yes  0 = no</td>
<td></td>
</tr>
<tr>
<td>If yes, how many________</td>
<td></td>
</tr>
<tr>
<td>If Yes Diagnosis________</td>
<td></td>
</tr>
<tr>
<td>Charges________________</td>
<td></td>
</tr>
<tr>
<td><strong>Amount of any out of pocket costs (co pays)</strong></td>
<td>$_______</td>
</tr>
</tbody>
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164
0 None
1. Public
2. Private

16_________Hospital D/C date   17______________length of hospital stay (days)

18_______________number of ED visits/hospital admission in past 24 months
<table>
<thead>
<tr>
<th>Inicio</th>
<th>Español del Participante</th>
<th>Español del Participante</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post dada de alta, ¿Cuándo fue a ver a su médico primario?</td>
<td>1 = Sí</td>
<td>0 = No</td>
</tr>
<tr>
<td>Post dada de alta, ¿Cuándo fue a ver a su Cardiólogo?</td>
<td>1 = Sí</td>
<td>0 = No</td>
</tr>
<tr>
<td>Sí Sí, a los cuantos días después de salir del hospital?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sí Sí, a los cuantos días después de salir del hospital?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post dada de alta, ¿Cuándo fue a ver a cualquier médico en el hogar?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post dada de alta, ¿Cuándo fue a ver al cualquier médico en el hogar?</td>
<td></td>
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<tr>
<td>Sí Sí, a los cuantos días después de salir del hospital?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sí Sí, a los cuantos días después de salir del hospital?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospitalizaciones 1 = Sí 0 = No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Si sí, cuantas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnóstico</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duración de estadía</td>
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<td></td>
</tr>
<tr>
<td>Costos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visitas a Emergencia 1 = Sí 0 = No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Si sí, cuantas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnóstico</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visitas de atención aguda 1 = Sí 0 = No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Si Sí, cuantas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnóstico</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costos</td>
<td></td>
<td></td>
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<tr>
<td>$ valor pagado de bolsillo (co pago)</td>
<td></td>
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</tr>
</tbody>
</table>
VITA

VALRIE REID

Born, Westmoreland, Jamaica

1986
B.S., Nursing
Florida State University
Tallahassee, Florida

1986 – 2019
RN/APRN
Jackson Health System
Miami, Florida

1996
M.S., Nursing
Barry University
Miami, Florida

2013 - 2020
Doctoral Candidate, Nursing
Florida International University
Miami, Florida

2018
Training Grant, Heart Failure Society Mini-
Nursing Research Grant (J. Hannan; Faculty
responsible for evaluation component). Funded by
Heart Failure Society of America 2018-2021, Total
Direct Costs $10,000