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# Effect of Home Telemonitoring on Heart Failure Hospital Readmissions Among Adult Hispanics

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*Walden University*

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# Walden University

College of Health Sciences

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Priscilla Caban

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Walden University

2017

Abstract

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Hispanics

by

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MSN, Walden University, 2012

BSN, Jacksonville University, 2006

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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## Abstract

Heart failure is ranked as one of the leading causes of hospitalizations and mortality among adults of all racial/ethnic groups in the United States. Telemonitoring, as a homecare intervention for heart failure management, has been used across all groups although the benefit for Hispanics not established. The purpose of this retrospective, quantitative study was to determine the differences in hospital readmission between Hispanic, non-Hispanic Black, and non-Hispanic White patients with heart failure disease who either received or did not receive home telemonitoring services from a homecare agency in Connecticut. The research questions for this study examined the effect of home telemonitoring, race, age, gender, and insurance on heart failure hospitalization across the 3 groups. The chronic care model was used as the theoretical framework for this study because it offers a method for reforming healthcare to ensure optimization in chronic disease management. A purposive sample of 138 records of patients admitted between January 1, 2012 and June 30, 2017 with a diagnosis of heart failure provided the data for the study. Data were analyzed by conducting a simple and multiple logistic regression analysis. The key findings of the simple logistic analysis showed that only Hispanics who used telemonitoring were almost 4 times less likely to be readmitted to the hospital compared to Hispanics who did not use telemonitoring ( $p = 0.04$ ). The multiple logistic analysis revealed race, age, gender, and insurance were not significant predictors of readmissions ( $p > 0.05$ ). The findings from this study may promote positive social change by providing healthcare providers with a better understanding of the effects of home telemonitoring for treating adult Hispanic patients with heart failure disease.

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## Dedication

My achievements, accomplishments, and completion of this dissertation are dedicated first and foremost to my Lord and Savior. Father, I thank you for the wisdom, patience, and perseverance you have blessed me with. For without You, I could have not attained such great accomplishments.

I also dedicate this dissertation to my wonderful husband, Julio, who provided me with never ending love and support throughout my academic journey.

Lastly, I dedicate this dissertation to my six amazing children, Jasmine, Roger, Laylah, Daniel, Marisela, and Juliana. The completion of my dissertation is a testament of how God can work in our lives to allow us to reach our goals. My prayers are for you all to dream big, work hard, and accomplish great things.

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## Chapter 1: Introduction to the Study

Cardiovascular disease (CVD) is the leading cause of death in the United States (Centers for Disease Control and Prevention [CDC], 2016a). Heart failure, one type of CVD, is a cardiovascular illness that is characterized by the heart's inability to pump blood normally (Torpy, Lynn, & Golub, 2011). Heart failure is among the leading cause of death among individuals 65 years of age or older in Connecticut where this study took place (Connecticut Department of Public Health [CDPH], 2016a). While heart failure affects all populations, this devastating disease has plagued many minority communities in the United States and is one of the major contributing factors for mortality and hospital readmissions among Hispanics and African Americans. The higher prevalence of heart failure-related mortality among Hispanics and African Americans is gravely associated with its' rate of severity and causes (Kelesidis, Varughese, Hourani, & Zolty, 2013). Hispanics and African Americans have an earlier onset of heart failure compared to non-Hispanic White Americans (Thompson et al., 2011). Hypertension is a significant heart failure risk factor that is found in 85% of African Americans and 75% of Hispanics age 65 or older (Czaja, Chin, Arana, Nair, & Sharit, 2016). While Hispanics are found to have a higher prevalence of cardiovascular risk factors when compared to non-Hispanic Whites, African Americans are found to have the highest prevalence of heart failure and adverse outcomes when compared to other racial groups (Lu et al., 2016; Rodriguez, Joynt, López, Saldaña, & Jha, 2011).

According to the CDC (2016a), 11.5% of United States adults are diagnosed with heart disease. It is projected that by 2030, 40.5% of the United States population will

have some form of cardiovascular disease (Heidenreich et al., 2011). Poorly managed chronic heart failure impacts the quality of life of those diagnosed with this debilitating disease, resulting in hospitalization related to frequent episodes of disease exacerbation. Obesity, hypertension, and diabetes are among the comorbidities that increase ones' risk of acquiring heart failure (Huffman et al., 2013). Heart failure is the leading cause of hospitalizations in the United States for adults over the age of 65 (Cavalier & Sickels, 2015). The management of this prevalent disease is costing the nation over \$30 billion a year. This figure includes health and medication management as well as lost days of work (CDC, 2016b). Over 17% of Connecticut's hospital discharges are cardiovascular related (CDPH, 2016a). The charges for hospital medical care in Connecticut among Black and Hispanic Americans are higher compared to those for White Americans (CDPH, 2016b). Although Black residents of Connecticut have higher age-adjusted hospital discharge rates for CVD, the age-adjusted hospital discharge rate for heart failure is significantly higher among the Hispanic residents.

Hispanics and non-Hispanic Blacks are at an increased risk for developing heart failure relative to non-Hispanic Whites (Thompson et al., 2011). Blacks have the highest incidence of heart failure, earlier onset, and poorer outcomes compared to Whites (Hughes & Granger, 2011). The high mortality and hospital readmission rates related to poor management of chronic heart failure has earned the attention of many health care providers and researchers (Ferrante et al., 2010; Ventura & Pina, 2010), including, the Centers for Medicare and Medicaid Services (Desai & Stevenson, 2012). Because of the prevalence of heart failure-related hospital readmissions, the Centers for Medicare and

Medicaid Services (CMS) have proposed holding health care providers and organizations financially responsible for the poor management of the disease (CMS, 2016). Heart failure admissions are responsible for 17% of the national health expenses and are predicted to increase (Heidenreich et al., 2011).

Medicare and Medicaid certified organizations must adhere to CMS's conditions for coverage (CfCs) and conditions of participation (CoPs) to maintain certification (CMS, 2016c). CMS proposed such standards to ensure the safety, quality of care, and protection of their beneficiaries. Furthermore, in accordance with demands of the Affordable Care Act to reduce hospital readmissions, CMS implemented new provisions for hospitals to follow. This Hospital Readmissions Reduction Program (HRRP), was implemented in October, 2012 (CMS, 2017). With the impending penalties, providers across the healthcare continuum were compelled to implement practice changes that will improve outcomes and ensure the delivery of quality of care and health protection of the patients under their care for acute heart failure disease. Organizations meeting the mandate are then able to receive Medicare and Medicaid reimbursement and in many cases, maintain fiscal viability. The need to provide care to patients with heart failure is therefore important from the standpoint of the individual who suffers with the disease and the organization that provides the care. One strategy that addresses both aspects of the problem is to provide telemonitoring services for patients who are referred to home care agencies for nursing interventions to manage heart failure exacerbation.

Despite significant strides in healthcare access for all populations across the nation, the minority populations continue to face numerous barriers in accessing and



receiving quality care. Hispanics are in vital need of effective nursing interventions to optimize the management of their chronic heart failure disease, improve health behaviors, minimize disparities, and reduce hospital readmission rates (Melton, Foli, Yehle, & Griggs, 2015). Improving the management of health and outcomes for Hispanics with heart failure is particularly important because of the growth of the condition in the Hispanic population. Heart failure disease is among the top three leading causes of death among the Hispanic population (CDC, 2016a). The age adjusted hospital discharge rates in Connecticut of patients with heart failure diagnosis is significantly higher among Hispanic or Latino residents when compared to White residents (CDPH, 2016a). In Connecticut, one local homecare agency whose majority patient population are Hispanics also identified heart failure-related hospital readmissions as a prevalent issue. In pursuit of improving the management of this population's heart failure illness, researchers have implemented various interventions and have examined the effects of such interventions in optimizing chronic heart failure disease management in various healthcare settings (Arungwa, 2014; McLaughlin, Hoy, & Glackin, 2015; Rodriguez, Joynt, López, Saldaña, & Jha, 2011). Yet, there is a lack of research regarding the effects of telemonitoring as a homecare nursing intervention on improving health behaviors and reducing heart failure-related hospital readmissions among the adult Hispanic population.

Due to the rise of heart failure-related hospital admissions among this vulnerable population, researchers and providers have examined various methods and interventions in effort to better manage the disease in patients diagnosed with heart failure disease. McLaughlin, Hoy, and Glacklin, (2015), examined a new intervention that involved a

heart failure nurse specialist. Extensive heart failure management education was provided to the patients and/or caregivers of patients with heart failure. This study showed improvement in heart failure disease management, medication adherence, and reduction in hospitalizations. In another study, an advanced practice nurse-led transitional care program also proved successful in reducing heart failure-related readmission rates (Stauffer et al., 2011). Ryan, Kang, Dolacky, Ingrassia, and Ganeshan, (2013) implemented an intervention in the acute care setting. This intervention was a quality improvement effort to reduce the rate of heart failure-related 30-day hospital readmissions. The providers implemented a new practice where all patients with heart failure diagnosis were provided a 7-day follow-up office visit upon their discharge. This study showed a reduction in 30-day readmissions corresponded with the 7-day follow-up intervention.

Heart failure still takes its toll when interventions or management strategies are ineffective or inaccessible to some of the most vulnerable populations. Thus, frequent readmissions to acute care may follow. The call for researchers to examine interventions that would impact the reduction of heart failure exacerbations and decrease associated hospitalizations is at its greatest demand. Researchers have examined home telemonitoring among elderly patients with heart failure and among patients with hypertension, and they have examined patients' characteristics associated with heart failure readmissions (Czaja, Chin, Arana, Nair, & Sharit, 2016; Guzman-Clark, van Servellen, Chang, Mentis, & Hahn, 2013; Radhakrishnan, Jacelon, & Roche, 2012). Further examination of the use of home telemonitoring services and their effects heart

failure exacerbation and hospital readmission rates across multiple ethnic groups is required. In this study, I expanded on the literature in order to examine the impact of home telemonitoring services in Connecticut on heart failure among Hispanics, non-Hispanic Blacks, and non-Hispanic Whites.

With this research study, I filled a gap in the literature by identifying the impact of home telemonitoring on hospital readmission for adult Hispanics, non-Hispanic Blacks, and non-Hispanic Whites with heart failure who are managed by one homecare agency in Connecticut. These patients received homecare nursing and telemonitoring services between January 1, 2012 and June 30, 2017. In addition to race/ethnicity, age, gender, and insurance were also tested for prediction of hospital readmission. Furthermore, I explicitly focused on the Hispanic population's hospitalizations related to the primary diagnosis of heart failure. The results of this study showed new evidence that can be used by providers of heart failure patients receiving home telemonitoring services.

The findings of this study may produce positive social change because it may provide health care providers with a better understanding of the effectiveness of home telemonitoring for treating adult Hispanic patients with chronic heart failure disease. The results revealed how race, telemonitoring, age, gender, and insurance predict hospital readmissions among heart failure patients who received home telemonitoring. Health care providers across the nation can use the results of this study to improve treatments and interventions used to reduce hospitalization related to heart failure. Implementing homebased interventions, such as telemonitoring, can have a positive effect on lowering total healthcare cost as it directly relates to reducing readmission rates and the costs

associated with hospitalizations (Maru et al., 2015). Thus, this may potentially reduce the financial burdens patients, health care providers, health care organizations, and insurers are currently battling.

In the remainder of this chapter I offer the following: (a) the background of the study, (b) the problem statement, (c) the purpose of the study, (d) the research questions and hypotheses, (e) the theoretical framework, (f) the nature of the study, (g) definition of terms, (h) assumptions, (i) scope and delimitations, (j) limitations, (k) the significance of the study, and (l) a summary.

### **Background**

In this section I provide a brief overview of the literature which shows the prevalence of heart failure hospitalizations and indicates that there is a gap in knowledge regarding the effects of home telemonitoring on the rate of readmissions among all ethnicities. After reading countless articles, I reached a point where I found that many peer-reviewed articles emphasized the challenges many providers and health care organizations, across the nation and locally, are facing to adequately manage the rate of heart failure related hospitalizations. The inability of health care providers to effectively manage heart failure is resulting in a great financial burden. The annual health care cost for heart failure in the United States is an estimated \$32.2 billion (Bui & Fonarow, 2012). Many researchers concur that heart failure is the leading cause of death and is among the leading causes for hospital admissions in the United States in individuals older than 65 years of age (Desai & Stevenson, 2012; Heron, 2013; Whittaker, Soine, & Errico, 2014). Connecticut is not resistant to this issue. In 2008, Connecticut hospitals' charges for CVD

was \$2.2 billion. About 15% of CVD were heart failure (CDPH, 2011). Ryan et al. (2013) found that heart failure readmissions were a problematic concern in one local Connecticut hospital. After implementing a quality initiative (QI) program, the objective of their study was to estimate the frequency of preventable readmissions of heart failure patients treated at the University of Connecticut (UConn) Health Center. Their findings showed that preventable readmissions were less common after the implementation of the QI program. Aseltine et al. (2015) investigated the prevalence of 30-day hospital readmissions in Connecticut. The purpose of their study was to examine, by race/ethnicity and insurance status, 30-day readmission rates for patients who were hospitalized for chest pain and heart failure. The authors concluded that racial and ethnic disparities were noted in hospital readmission rates for heart failure, chest pain, and shock.

### **Racial/ Ethnic Disparities**

There is substantial information in the literature indicating that race and ethnicity have a significant impact on heart failure management. Hispanics and African Americans have greater coexisting conditions, risk, socioeconomic, and cultural factors that contribute to their higher occurrences of heart failure compared to White Americans (Kelesidis, Varughese, Hourani, & Zolty, 2013). Graham (2014), examined the risk factors related to the prevalence of heart failure in racial and ethnic minorities. Risk factors such as hypertension, diabetes, and obesity were found to have a higher prevalence in minorities when compared to White Americans. Hypertension is significantly correlated to heart failure (Czaja, Chin, Arana, Nair, & Sharit, 2016).

African American adults have the highest rates of hypertension in the world, whereas Hispanics have high rates of diabetes and obesity. Eighty five percent of African Americans and 74% of Hispanics over the age of 65 have hypertension. Bagchi et al. (2016) examined racial/ethnic disparities and the equitable access to health insurance coverage among TRICARE beneficiaries with heart failure. The findings showed racial and ethnic disparities in the receipt of pharmacological therapy for heart failure among the beneficiaries. The study supported previous research indicating that equal access to care may lessen racial/ethnic health disparities. Heart failure is a true problem for individuals of all racial and ethnic backgrounds. Healthcare providers must bear in mind the many factors that put individuals at a greater risk for poor management so adequate interventions and treatment plans can be prescribed.

### **Adherence**

Researchers have become increasingly concerned with the rate heart failure patients adhere to their prescribed medications. Wu et al. (2013) examined medication adherence among heart failure patients. The findings in their study showed that patients with medication nonadherence and lower perceived social support (PSS) had a 3.5 times higher risk of cardiac events than those who were adherent and had higher PSS. Treatment adherence among minority groups with heart failure has major implications. Zhang and Baik (2014) found that adherence to heart failure medications among Native Americans, Blacks, and Hispanics continue to be a problematic issue compared to adherence by Whites. Despite adjustment for age, gender, income, drug coverage, and health status, minorities were still less likely to adhere in comparison to Whites.

## **Interventions**

Fleming and Kociol (2014) addressed the various interventions used by providers in treating patients with heart failure. Successful strategies in managing heart failure include multidisciplinary hospital-based approaches, disease management programs, and transitional care initiatives. The use of telemonitoring has inconclusively shown to be successful in managing heart failure (Bui & Fonarow, 2012; Fleming & Kociol, 2014). Ryan, Kang, Dolacky, Ingrassia, and Ganeshan (2013) examined the effects of a treatment intervention for patients serviced at UCONN Health Center for heart failure by implementing 7-day follow up appointments with patients after discharged from the hospital. Their study showed a decrease in 30-day readmission rate for patients with heart failure after the implementation of this treatment intervention. In another study, rapid clinic follow-up appointments post-heart failure hospital admission, were found to have a positive impact on heart failure related admissions and on reducing associated health care costs (Welch et al., 2016). Ferrante et al. (2010) examined the effects of a telephone intervention on chronic heart failure. The results showed the rate of heart failure related deaths and hospitalization were lower in the intervention group.

## **Statement of the Problem**

Ineffective management of heart failure is associated with increasing hospital readmission rates, mortality rates, and health care expenditures globally and nationally (Bruin, Heijink, Richard, Struijs, & Baan, 2011; Parissis et. al., 2014). The literature has shown the challenges health care providers around the world are facing with gaining control over heart failure related hospital readmissions. In the United States, one out of

every four patients with heart failure is readmitted to the hospital within 30 days of being discharged (Bradley et. al., 2013; McClintock & Smith, 2014). In pursuit of controlling health care costs related to heart failure, CMS has begun holding health care providers responsible for improving the rate of hospital readmission within 30 days of discharge related to heart failure (CMS, 2016a). The United States is a diverse nation, and the literature shows that minorities are at a higher risk for acquiring heart failure.

Hispanics have the second highest risk for acquiring heart failure after African Americans when compared to White Americans (Melton, Foli, Yehle, & Griggs, 2015). Providers are required to implement practices and interventions that would reduce heart failure associated readmission, which means keeping patients at home longer. Researchers have shown the many different strategies providers have implemented in attempt to reduce heart failure admissions. These include hospital-, home-, and clinic-based interventions (Stewart et al., 2012). Unfortunately, there is little data regarding the effectiveness of home telemonitoring and its effects on reducing heart failure readmission.

### **Purpose of the Study**

The purpose of this retrospective, quantitative study was to determine the difference of hospital readmission between three racial/ethnic groups of patients with heart failure disease who received and did not receive home telemonitoring services. In addition to examining telemonitoring and race, I tested to see if age, gender, and insurance predicted heart failure readmission. The three racial/ethnic groups examined in



this study were Hispanics, non-Hispanic Blacks, and non-Hispanic Whites who received services from one homecare agency in Connecticut.

### **Research Questions and Hypotheses**

Research Question 1: Is there a difference in heart failure hospital readmission for adult Hispanics who received or did not receive telemonitoring services by one homecare agency in Connecticut compared to non- Hispanic Whites or non-Hispanic Blacks?

$H_01$ : There will be no difference in heart failure hospital readmission for adult Hispanics who received or did not receive telemonitoring services by one homecare agency in Connecticut compared to non-Hispanic Whites or non-Hispanic Blacks.

$H_{a1}$ : There will be a difference in heart failure hospital readmission for adult Hispanics who received or did not receive telemonitoring services by one homecare agency in Connecticut compared to non- Hispanic Whites or non-Hispanic Blacks.

Research Question 2: Do race, telemonitoring, age, gender, and insurance predict heart failure readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received services by one homecare agency in Connecticut?

$H_02$ : Race, telemonitoring, age, gender, and insurance are not predictors of heart failure readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received homecare services by one agency in Connecticut.

$H_{a2}$ : Race, telemonitoring, age, gender, and insurance are predictors of heart failure readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received homecare services by one agency in Connecticut.

## **Theoretical Framework**

The Chronic Care Model (CCM) served as the theoretical framework for this paper. Dr. Edward Wagner developed the CCM to use as a guide for the management of chronic illness by health care providers to provide high quality care (Willemse, Adriaenssens, Dilles, & Remmen, 2014). The CCM represents a method for reforming health care through the interactions of six interrelated elements of the health system (Baptista et al., 2016). The six elements are (a) organization of health care, (b) self-management support, (c) decision support, (d) delivery system design, (e) clinical information systems, and (f) community resources. In this study, I focused on the community component of the CCM because I addressed the effects of telemonitoring in the homecare setting as it relates to the management of chronic heart failure disease among adult Hispanics' hospital readmission rates. Researchers have applied the CCM to community settings to address chronic health issues and health disparities among vulnerable and underserved populations (Haggstrom, Taplin, Monahan, & Clauser, 2012). For this reason, the CCM was well-suited for the aim of this study.

## **Nature of the Study**

This was a quantitative, retrospective study examining hospital readmission of Hispanics who are on home healthcare services for management of their chronic heart failure illness. To gain further knowledge of this prevalent issue and the effectiveness of home telemonitoring, I conducted a three-group comparison examining heart failure hospitalization across Hispanics, non-Hispanic Blacks, and non-Hispanic Whites. Retrospective data were collected and analyzed to gain further insight regarding home

telemonitoring on heart failure management across the three racial/ethnic groups. I collected this retrospective data from one local Connecticut homecare agency that implemented home telemonitoring services in 2008. The patients' information were extrapolated from electronic health records and de-identified to maintain anonymity. I collected data from the homecare agency from January 1, 2012 to June 30, 2017. Literature on this topic supports the application of a retrospective approach (McLaughlin, Hoy, & Glackin, 2015; Ryan et al., 2013), which is the selected method for this study. I took this approach to examine the use of home telemonitoring services on adult Hispanic patients' heart failure hospital admissions compared to those of non-Hispanic Black and non-Hispanic White patients. This quantitative study should help to identify if there is a difference of heart failure-related hospital readmissions across three racial/ethnic groups who received home telemonitoring services.

### **Definitions**

This section provides definitions of key terms found in this study and commonly used in the health care field.

*Cardiovascular disease (CVD)*: The collective name for a wide variety of heart and blood vessel diseases (CDPH, 2016a).

*Conditions for coverage (CfCs) and conditions of participation (CoPs)*: Health and safety standards, set by CMS, that healthcare organizations must meet in order to begin and continue participating in Medicare and Medicaid programs (CMS, 2016c).

*Heart Failure (heart failure):* A clinical syndrome that may result from any structural or cardiac disorder that impairs the pumping ability of the heart (McLaughlin, Hoy, & Glacklin, 2015).

*Heart failure readmission rates:* An admission to a hospital for heart failure within 30 days of a discharge from the same or another hospital (CMS, 2017).

*Homecare nursing intervention:* Skilled nursing services in the patient's private residence (CMS, 2016b).

*Hospital readmission rates:* An admission to a hospital within 30 days of a discharge from the same or another hospital (CMS, 2017).

*Telemonitor/telemonitoring:* Professional services given to a patient through an interactive telecommunications system by a practitioner at a distant site (CMS, 2016b). It also involves wireless technology for remote follow-up. Telemonitoring wirelessly transmits parameters such as weight, heart rate, or blood pressure for review by health-care professionals (Hasan & Paul, 2011).

### **Assumptions**

I assumed that all registered nurses who saw heart failure patients in the homecare agency where this study took place received equal training in telemonitoring. I also assumed that Hispanic, non-Hispanic Black, and White patients with heart failure were offered telemonitoring services upon admission to homecare services. Further, I assumed that the patients were monitored for readmissions to the hospital while receiving homecare services.

### **Scope and Delimitations**

The scope of this study included retrospective chart review from one homecare agency located in Connecticut. I used a purposive approach to select and obtain the samples. The HRRP was implemented in October 2012, and many health care organization moved forward with implementing new practice changes to reduce hospital readmissions (CMS, 2017). For this reason, I collected, analyzed, and compared data from electronic health records from patients who received homecare services during the period of January 1, 2012 through June 30, 2017 for a primary diagnosis of heart failure. Charts were selected after January 2012 to ensure an adequate sample size was obtained to conduct this study.

### **Limitations**

There were several limitations to consider for this study. The sample size was relatively small after the stratification of charts that met the inclusion criteria, and the use of a non-probability approach does not allow for generalizability. To ensure an adequate sample size was selected, I used a power analysis of 0.80.

### **Significance of the Study**

With this research study, I sought to fill a gap in the literature by examining home telemonitoring among adult Hispanics with heart failure who were managed by a homecare agency and comparing the results to the same data from non-Hispanic Blacks and non-Hispanic Whites. Furthermore, I examined additional predictors of hospital readmission related to a primary diagnosis of heart failure. The additional predictors examined were age, gender, and insurance. All data were compared to the same

racial/ethnic groups listed above. The results of this study yielded new evidence and knowledge for providers of patients receiving telemonitoring services while receiving homecare.

Other researchers have examined the use of telemonitoring in managing chronic heart failure illness (Willemse, Adriaenssens, Dilles, & Remmen, 2014). However, in reviewing the literature, I found no research regarding the impact of telemonitoring on special populations such as the Hispanic population who are served in the homecare setting. For this reason, more information is needed surrounding this issue to ensure the delivery of the highest quality nursing care to the Hispanic and other populations diagnosed with chronic heart failure. Nursing's best practices rely greatly on research to provide the highest quality care possible to patients (Bohnenkamp, Pelton, Rishel, & Kurtin, 2014; Groves, Burns, & Gray, 2013). Thus, new evidence may support optimization of chronic heart failure management for Hispanic patients receiving telemonitoring services. Furthermore, if the findings support the use of telemonitors and homecare nursing services, healthcare providers can prescribe these services as treatment and management of heart failure for other populations. Increasing awareness and knowledge can lead to positive social change as the findings in this study can pave the way for further research to examine home telemonitoring on heart failure outcomes among other populations.

### **Summary**

The hospital readmission rate related to heart failure has extraordinary financial repercussions in the United States. The country's healthcare expenditure for heart failure

is \$32 billion (Bui & Fonarow, 2012). Hispanics and non-Hispanic Blacks are higher risk for acquiring heart failure when compared to White Americans (Melton, Foli, Yehle, & Griggs, 2015). Healthcare providers across the nation continue to struggle with reducing the rate of heart failure readmissions and reducing the cost related to heart failure. In attempt to control the cost of heart failure, CMS has proposed holding health care providers responsible for improving the rate of hospital readmission within 30 days of discharge related to heart failure (CMS, 2016a). This act from CMS has pushed providers across the nation in the direction of improving practice and interventions for patients who are under their care for heart failure. One homecare agency in Connecticut implemented the use of telemonitors as a nursing intervention in treating patients at home for heart failure. The use of the telemonitoring equipment in the home, allowed for in-home daily monitoring of the patients' vital signs and weight. The patients were taught how to use the digital equipment, which entailed putting on the blood pressure cuff, stepping on a digital scale, and submitting the results to the agency electronically. The purpose of this study was to examine the impact of telemonitoring, as a homecare nursing intervention, on hospital readmission for Hispanic patients with heart failure in comparison to non-Hispanic Blacks and Non- Hispanic Whites who were serviced by one homecare agency in Connecticut. The review of literature in Chapter 2 shows the gap in knowledge regarding the impact of home telemonitoring on the reduction of heart failure readmission among Hispanics.

## Chapter 2: Literature Review

### **Introduction**

Heart failure hospital readmission rates among Hispanics in the United States continue to burden this population (Rodriguez, Joynt, López, Saldaña, & Jha, 2011; Vivo, Krim, & Cevik, 2009). For this literature review, I gathered and read articles on the prevalence of heart failure readmissions among Hispanics, non-Hispanic Blacks, and non-Hispanic in the United States. This chapter includes the following sections: (a) Literature Search Strategies, (b) Theoretical Foundation, (c) Literature Review of Key Variables, (d) Conclusion, and (e) Summary. The key variables are heart failure readmission rates, racial/ethnic disparities, adherence, and interventions. The content of this literature review demonstrates the significance, realism, and impact heart failure disease has on many people. The inability to adequately manage heart failure readmissions gained the attention of the United States federal government and healthcare providers. The CMS, a federal agency funding Medicare and Medicaid services, played a significant role in addressing the issue of heart failure related hospitalization. Due to the fear of facing financial repercussions and concern for ensuring that individuals with heart failure illness sustain quality life, healthcare providers have implemented practice changes and interventions to meet the needs of the heart failure population (Fleming & Kociol, 2014). Hospital and community providers are all tasked with reducing heart failure readmissions. As I indicated in Chapter 1, one Connecticut homecare agency implemented telemonitoring as an intervention for heart failure. The purpose of this



quantitative study was to examine home telemonitoring on heart failure readmissions among Hispanics, non-Hispanic Blacks, and non-Hispanic Whites.

### **Literature Search Strategies**

I used the following databases and websites to search for literature: Cochrane, MEDLINE, CINAHL, DARE, Ebsco Host, PubMed, ProQuest, Group Health Institute, CDPH, American Heart Association (AHA), CDC, CMS, National Association for Homecare and Hospice, Connecticut Association for Healthcare at Home, Connecticut Medicine, and American College of Cardiology. The literature search focused on heart failure readmissions in United States and Connecticut, the prevalence of heart failure mortality among Hispanics, non-Hispanic Blacks, and non-Hispanic Whites in the United States, the health care expenditures associated with heart failure readmissions, and the use of telemonitoring at home for patients with heart failure. I used the following key words and phrases to search for literature: *heart failure readmissions, heart failure in the United States, heart failure in Connecticut, heart failure readmission rate in Connecticut, Hispanics and heart failure, African Americans with heart failure, White Americans with heart failure, homecare and heart failure, home telehealth for heart failure, telemonitoring, Hispanics and home telehealth, heart failure adherence, Hispanic population in Connecticut, chronic care model, hospital strategies associated with 30 day readmissions for patients with heart failure, 30 day readmissions, heart failure adherence among minorities, home telehealth adherence, minorities and telehealth, cost analysis of heart failure readmission, health care expenditures related to heart failure,*

*and cost burden of heart failure*. The articles used in this literature review were published between the years of 2010 and 2016. These articles are listed in the reference section.

### **Theoretical Foundation**

The Chronic care model served as the theoretical foundation for this study. To improve the quality of life of individuals living with chronic illness, the Robert Wood Johnson Foundation (RWJF) has funded various research investigations since the late 1970s, such as the Chronic Disease Program and the Chronic Mental Illness Program (Wielawski, 2006). The RWJF also funded the Improving Chronic Illness Care initiative spearheaded by Dr. Edward Wagner (Wielawski). Wagner is the founding director of the Group Health Research Institute and the MacColl Center for Healthcare Innovation. He and his team developed the chronic care model, sharing with healthcare organizations and providers the significance for improving quality of life for those with chronic illnesses (Group Health Research Institute, 2017a).

The CCM is a guide to be used by health care providers in caring for patients with chronic illnesses to improve health outcomes (Coleman, Austin, Brach, & Wagner, 2009). Under the CCM, physicians, nurses, case managers, dieticians, and patient educators work collaboratively to address the needs of the patient (Wielawski, 2006). It is composed of six interrelated systems designed to optimize the management of chronic illness (Mackey et al., 2012). These elements are (a) community linkages, (b) organizational support, (c) self-management support, (d) delivery system design, (e) decision support, and (f) clinical information systems. Community linkage and resource refers to community providers encouraging patients to participate in the disease

management care (Wielawski, 2006). Organizational support consists of health care systems achieving excellence in services through implementing improvement strategies. Self-management support entails healthcare providers enabling patients to become active parts of their care plan through setting goals and adjusting treatment. Delivery system design encourages providers to move from a one-on-one approach to patient care, to a team approach. In the team approach, it is imperative that the clinical staff defines their role and tasks. The act of linking treatment to evidence defines decision support. The final element, clinical information system, consists of efficiently delivering disease management information, as in care guidelines and test results, using computers. Healthcare organizations and providers integrate these six elements to optimize chronic disease outcomes by engaging patients in becoming the key players in their disease management.

The CCM has played a pivotal role in optimizing the quality of the delivery of healthcare for chronic illnesses in the United States (Coleman, Austin, Brach, & Wagner, 2009). The CCM has also served as the framework for many research studies seeking to optimize chronic disease management. Baptista et al. (2016) used the CCM constructs to conduct a systematic review of literature in which the CCM served as the theoretical foundation for studies examining interventions on outcomes among patients with type 2 diabetes (T2DM). Of the 12 articles included in this systematic review, 6 demonstrated effectiveness of the CCM for T2DM management.

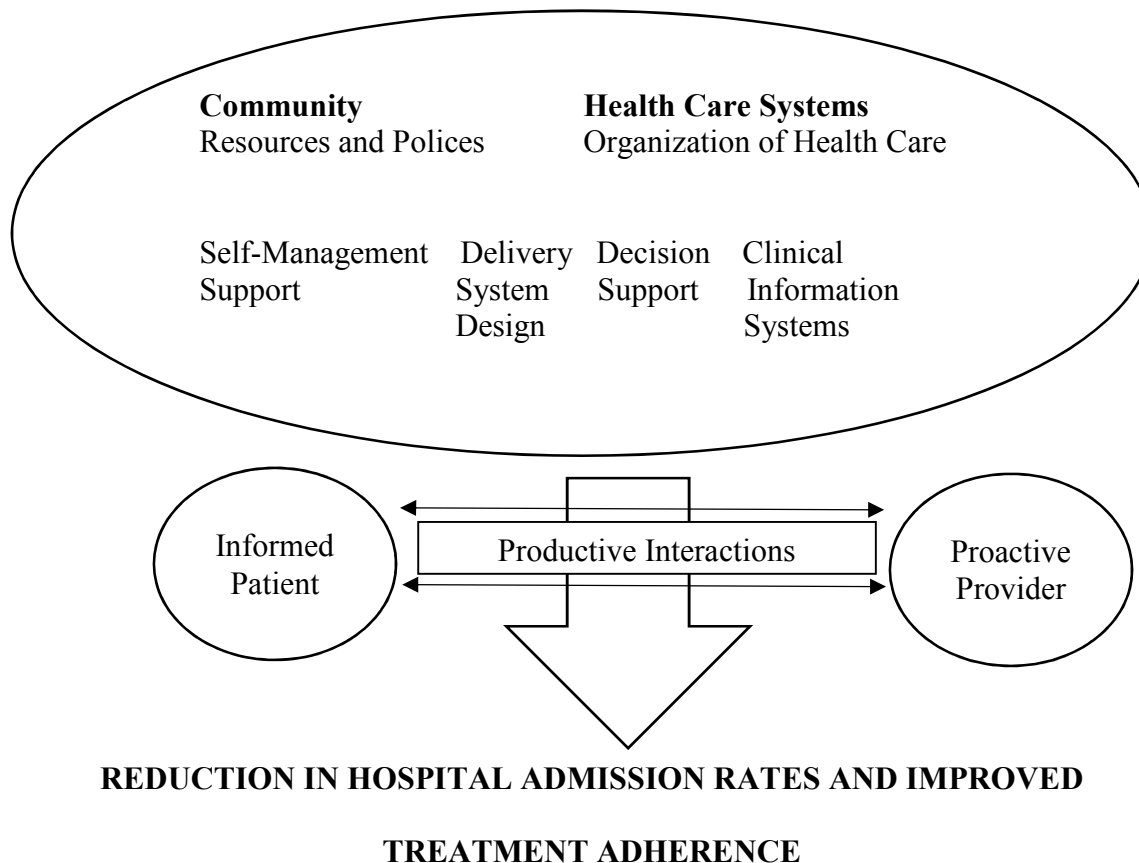
Haggstrom, Taplin, Monahan, and Clauser (2012) examined the six components of the chronic care model (CCM) in effort to increase cancer screening and follow-up

among the underserved populations. They concluded that implementation of the CCM was associated with cancer care process improvement. Holm and Severinsson (2014), conducted a qualitative study to determine healthcare team members' perceptions of the improvement of care for older people with depression living in the community after the implementation of the CCM. The researchers identified four themes that emerged through their analysis: (a) ensuring a pathway to the top level of the organization; (b) the need for leadership from senior managers; (c) the need to formalize collaboration; and (d) increasing self-management. Their findings indicated that the CCM can improve interventions with the increased collaboration among the healthcare team members and leaders.

Willemse, Adriaenssens, Dilles, and Remmen (2014) conducted a qualitative study seeking to describe the extent telemonitoring projects coincide with the CCM. Telemonitoring is an intervention used in effort of optimizing the management of chronic illnesses, such as heart failure. Unfortunately, patients' adherence to telemonitoring in the homecare setting appears to have its challenges. As Willemse et al. noted, cooperation and coordination of telemonitoring at home between the patient's health care providers poses as great barriers. It was Wagner's goal to engage health care providers in working collaboratively and applying research evidence in treating chronic illness. In the event where there is poor collaboration across the healthcare team members and across the healthcare continuum, the patients' outcomes will be impacted.

The key concept of the CCM is "change." The model is composed of six elements that are intended to work as one in meeting the needs of individuals with chronic

illnesses. Within each of the six elements of the CCM, there are specific change concepts that are adopted and followed by the team members to guide their improvement efforts (Group Health Research Institute, 2017b). The improved outcomes for chronic diseases and treatment adherence are products of effective interactions between the informed patient and proactive provider (Barr et al., 2003). The CCM offers a framework that healthcare providers can use to devise interventions and plans to address the needs of individuals with chronic health illnesses. Figure 1 is a map and a table of the key concepts of the CCM.



Model Components	Examples in the Setting of Home Care /Home Telemonitoring
Community resources and polices	Effective community programs and resource used to encourage participation, Living situation, home support system
Healthcare system- organization of healthcare	Identify support of senior leaders, incentives
Self-management support system	Skills training, Educational resources
Decision support	Education and support provided to nurses and providers
Delivery system support	Planned visits, Identified roles of healthcare team members
Clinical information systems	Appropriateness of telemonitoring, availability in Spanish

*Figure 1.* The chronic care model and heart failure treatment.

### **Heart Failure Readmissions**

The prevalence of heart failure in the United States is alarming. There are 6.5 million adults in the United States with heart failure, and this number is expected to rise by 25% by 2030 (Butler & Kalogeropoulos, 2012). Heart failure is associated with high morbidity, mortality, and healthcare expenditures (Gheorghiade, Vaduganathan, Fonarow, & Bonow, 2013). It is also the most common cause for hospital readmissions among individuals over 65 years of age in the United States (Whittaker, Soine, & Errico, 2014). Per Sherer, Crane, Abel, and Efird (2016), heart failure is in among the top 2 discharge diagnoses in the elderly population. About 50% of heart failure discharges are readmitted within 60 days of hospital discharge (Desai & Stevenson, 2012). The trend of rising heart failure readmissions is predicted to persist due to the increase in longevity (Hebert et al., 2011). The mortality rate in the United States steadily declined for 10 years, but now the rate is slowly increasing again (Brauser, 2017). One in every 9 deaths in the United States is identified as heart failure related (CDC, 2017). Also, about half of the people diagnosed with heart failure die within 5 years of being diagnosed with this life-threatening disease. In Connecticut, heart failure is the first leading cause of death of residents age 65 and older, with the risk of death increasing with age (CDPH, 2011).

The rate of readmission to the hospital within 30 days of discharge related to heart failure is astonishing. Twenty- seven percent of Medicare beneficiaries in the United States discharged from the hospital are readmitted within 30 days. Among this number, 37% of the readmissions are related to heart failure (Gheorghiade, Vaduganathan, Fonarow, & Bonow, 2013). In Connecticut, over 17% of hospital discharges are

cardiovascular related (CDPH, 2016a). In the United States, the 30-day heart failure readmission rates among Blacks and Hispanics are generally 10-20% higher than those of Whites (Aseltine, Yan, Gruss, Wagner, & Katz, 2015). Hispanic patients have slightly longer length of stay in the hospital related to heart failure than non-Hispanic Whites (Rodriguez, Joynt, López, Saldaña, & Jha, 2011).

The inability of healthcare organizations across the nation to adequately control heart failure hospitalizations and readmissions is resulting in extraordinary financial burdens. The healthcare expenditure in Connecticut alone for managing CVD was \$2.2 billion (CDPH, 2011). Of that, approximately 15% was for the management of heart failure. Without adequate interventions, the adverse effects associated with heart failure will continue. It is imperative that healthcare team members and organizations across the healthcare continuum continue to work towards identifying and implementing best practices for the well-being of the patients affected by heart failure disease.

### **Racial and Ethnic Disparities**

Heart failure disease impacts the lives of individuals of all racial and ethnic groups. Unfortunately, racial and ethnic disparities among patients with heart failure are a commonality. Evidence of disparities reveal that Hispanics and Blacks are at higher risk for acquiring heart failure disease when compared to White Americans (Casper et al., 2010; CDPH, 2016b). Blacks have the highest incidence of acquiring heart failure compared to Hispanics and Whites (Hughes & Granger, 2011). They also acquire heart failure at a younger age compared to Whites (Chen, Dharmarajan, Wang, & Krumholz, 2013). Moreover, Hispanics, when compared to Whites, have a higher incident of



acquiring heart failure at a younger age and have a greater rate of readmissions (Rodriguez, Joynt, López, Saldaña, & Jha, 2011; Vivo, Krim, & Cevik, 2009). Such facts suggest that the minority populations, when compared to White Americans, are impacted the most by heart failure due to greater disparities.

Health disparities among minorities in the United States are associated with factors such as poor socioeconomic status and poor healthcare access. Patients' inability to access healthcare services, will impact their success rate of gaining adequate control over their chronic heart failure disease. Minority groups, compared to non-minority groups, have a higher rate of low income and poorer access to healthcare services (Graham, 2014; Zhang & Baik, 2014). Poor access to healthcare includes factors such as lesser means of obtaining transportation to follow- up appointments, barriers of obtaining medications from the pharmacy, inability to pay for prescribed heart failure medications, or inability to afford prescribed diet. Poor social support or patients living alone are additional barriers minorities face in managing their chronic health disease. Lu et al. (2016), concluded in their study that socioeconomic factors, such as marital status and living conditions, significantly correlated with mortality and 30-day readmission rate in African American (AA) with heart failure disease. Specifically, married patients and those patients living with family independently predict lower mortality and fewer readmissions.

Hispanics, African Americans, and other minorities in the United States have higher incidences of inability to access healthcare due to their poorer economic status. They are also found to be at greater risk for having more comorbidities that are associated

with acquiring heart failure (Joshi, Marino, Bhoi, & McCoy, 2011; Vivo, Krim, & Cevik, 2009). Hypertension, diabetes mellitus, and obesity are prevalent among African Americans, Hispanics, and other non-White American minority groups in the United States. (Graham, 2014; Hughes & Granger, 2011; & Melton, Foli, Yehle, & Griggs, 2015). Hypertension is associated with a higher risk for heart failure (Huffman et al., 2013). Such comorbidities are highly correlated with heart failure disease. Reducing health disparities among African American, Hispanics, and other minority groups in the United States is an essential component in improving chronic disease management, reducing hospitalizations, thus reducing the associated health care expenditures (LaVeist, Gaskin, & Richard, 2011). In the state of Connecticut, government services were aimed towards ensuring all residents have equal access to healthcare. Since the implementation of the Affordable Care Act (ACA) in 2013, the number of Medicaid D enrollees in CT increased by 97.9%, (Connecticut Voices for Children, 2015). Medicaid D is eligible to adults without children of low income. In 2011, 40% of Medicare-Medicaid Fee for Service (FFS) enrollees had heart disease, heart failure, or another form of cardiovascular disease (CMS, 2011). To reduce the rate of heart failure exacerbation resulting in hospitalization, individuals of poor economic status in the state of CT could enroll into a Medicaid plan.

Hispanics and other non-English speaking minorities in the United States encounter significantly greater disparities in maximizing their chronic illnesses as evidenced by their higher rates of hospitalizations. In the U.S., there are approximately 25 million people unable to speak English fluently (Edwards, Rooshenas, & Isaacs,

2016). A patient's inability to speak fluent English in the United States may impact adherence. Telemonitoring is a complex system that may not be well understood by non-English speaking minorities, positioning them at a greater risk for poorer management of their chronic disease.

### **Adherence**

Adherence to treatment for the management of chronic illnesses is essential to reduce the occurrences of disease exacerbation which leads to avoidable emergency room visits, hospitalizations, and mortality (Mackey et al., 2012; Wu et al., 2013). The factors behind patients' non-adherence vary and are found to be inconsistent in the literature (Riles, Jain, & Fendrick). Wu et al., (2013), suggests that interventions aiming to improve clinical outcomes should include consideration of addressing medication adherence and social support. Patients who lack social support have been found to have significantly higher 30-day readmission rates and a higher 1-year mortality rate when compared to those who have social support or are married (Lu et al., 2016). Medication adherence, a modifiable risk factor, has significant implications on the rate of heart failure readmissions. Non-adherent patients have a 2.5 times greater rate for hospital readmissions compared to adherent patients and the rate of adherence can be as low as 50% (Riles, Jain, & Fendrick, 2014; Turner, Sloan, Kivlahan, & Kaselkorn, 2014).

Research has revealed the positive effects home telehealth monitoring has on improving the rate of medication adherence among patients with chronic illnesses (Turner et al., 2014). The effectiveness of home telemonitoring relies significantly on the patients' level of engagement and commitment to adhere to the plan of care. The rate of

the patients' level of adherence on home telemonitoring has been found to decrease the longer the patient remained on home telemonitoring services (Guzman-Clark, van Servellen, Chang, Menten, & Hahn, 2013). Ensuring patients' adherence to their treatment plan is impacted by a multitude of challenges. Recognizing potential barriers to reaching optimal outcomes and improvement in patients' chronic disease management, is a critical component to being able to devise an appropriate plan of interventions. The reasons for non-adherence are multifactorial. Individuals of poor socioeconomic status coupled with patient factors, are found to have a higher rate of poor adherence to heart failure treatment (Riles, Jain, & Fendrick, (2014); Zivin, Ratliff, Heisler, Langa, & Piette, 2010). Minority groups, including African Americans, Hispanics, Asians, and Native Americans, have a lower likelihood for good adherence for taking heart failure medications, in comparison to White Americans (Zhang & Baik, 2014). In addition to socioeconomic and ethnicity factors, are age factors.

Home telemonitoring can be challenging for the elderly population. Older adults may experience greater difficulties in adhering to home telemonitoring due to the complexity of the equipment (Czaja, Chin, Arana, Nair, & Sharit, 2016). Another vital component to ensuring optimal effectiveness of home telemonitoring is provider participation. Riles, Jain, and Fendrick, (2014), found that medication adherence to be positively correlated to the strength of the patient-provider relationship among patients of chronic disease states. Home telemonitoring requires the commitment and willingness of providers to monitor the data of their patients daily. Therefore, providers' adherence to the plan is an additional consideration and potential barrier (Czaja et al., 2016).

Medication and home telemonitoring adherence are important in managing chronic illnesses. The rate of medications adherence among patients with heart failure is not optimal (Yancy et al., 2010). Poor adherence is among the major contributing factors of heart failure readmissions (Lambrinou, Kalogirou, Lamnisos, & Sourtzi, 2012). Minorities and social-economically challenged individuals with heart failure have a higher prevalence for readmission (Mangla et al., 2014). Patients' poor knowledge of their illness and poor understanding regarding the indication for pharmacology management, results in failure of adherence to their medications (McLaughlin, Hoy, & Glacklin, 2015; Riles, Jain, & Fendrick, 2014). Poor understanding in managing home telemonitoring equipment may also result in failure of adherence (Czaja, Chin, Arana, Nair, & Sharit, 2016). Improvement in patients' adherence to their heart failure medications and adherence with using the home telemonitoring equipment will result in improved health outcomes, improved chronic disease management, reduction in the rate of urgent care visits, and reduced rate of hospitalizations (Czaja, Chin, Arana, Nair, & Sharit, 2016; Roebuck, Liberman, Gemmill-Toyama, & Brennan, 2011; Santos, Oliveira, & Araujo, 2013). Mangla et al. (2014), suggested that fostering patients' self-management skills and gaining providers' commitment to adhere to evidenced-based therapy, simultaneously, would yield optimal outcomes in heart failure patients. Overall, treatment adherence is met with significant challenges and without effective tactics on how to address this prominent issue or without the full cooperation of healthcare providers and patients' commitment, the barriers to improving the management of chronic illnesses will remain.

Home telemonitoring adherence among patients of various socioeconomic, ethnic, and age groups need further exploration to better understand the level of adherence that exists among these populations. Patients' adherence to home telemonitoring does not stand alone. Multidisciplinary and systems adherence are critical influences in ensuring the optimization of chronic disease management (Kuo et al., 2011). Kuo et al., focused on improving clinical outcomes on stroke patients by ensuring they devised an intervention that would successfully integrate the six elements of Wagner's chronic care model (CCM). In using the CCM as guide to their study and using home telemonitoring services, the authors revealed statistical significant finding ( $p < 0.001$ ) that their patients' adherence of daily blood pressure (BP) monitoring increased from 45.5% to 76%. Treatment adherence for individuals with chronic illness includes pharmacological, diet, exercise, and technological management. Successful disease management is gravely impacted by the individuals' level of adherence to all parts of their prescribed regimen. Patients require the support and commitment of community providers, home care nurses, and other members of the healthcare system involved in the plan of care to maximize their rate of adherence. With increased treatment adherence will come improvement in clinical outcomes, reduction in chronic disease exacerbation, and reduction in associated hospitalization.

### **Intervention**

Many providers across the healthcare continuum recognize the prevalence of heart failure readmissions. The vision to improve the outcomes, reduce hospital readmissions, and improve quality of lives of the patients with heart failure, has empowered healthcare

providers, workers, and organizations to implement interventions that would set new standards of practice in caring for patients with heart failure. Furthermore, the threat of facing financial repercussions identified by Centers for Medicare and Medicaid services has also provided the incentive for such initiatives to take in effect (CMS, 2016a).

Hospitals face losing  $\leq 3\%$  of their Medicare reimbursement for patients readmitted within 30 days of discharge (Bradley et al., 2013). Healthcare providers, trialed and implemented new heart failure interventions and programs in a variety of settings across the healthcare continuum. Such settings include hospital, home, and outpatient clinic environments. Multidisciplinary approaches can be found at the core of various trialed disease management programs and interventions designed for heart failure (Fleming & Kociol, 2014; Maru et al., 2015).

Heart failure disease management programs consists of myriad of interventions. In one study, the researchers trialed a quality improvement (QI) program in the hospital setting. The Heart Quality Team (HQT) was designed to improve the transition of care from hospital to home among heart failure patients discharged from the University of Connecticut (UCONN) John Dempsey Hospital (Ryan et al., 2013). This was a retrospective analysis of electronic health records of patients admitted between the years of 2008 to 2010, with a diagnosis of heart failure. This was a multidisciplinary quality initiative that revealed a decrease in preventable heart failure 30-day readmissions. The success of this initiative was significantly dependent on the teams' collaborative efforts in meeting the needs of heart failure patients. Follow-up phone calls were made to the patients within 48 to 72 hours of discharge. This team also implemented an intervention,

consistent with the “Hospital to Home- See you in 7” program, which ensured that all patients discharged from the hospital with heart failure would have a 7-day follow-up appointment with their provider prior to being discharged (Ryan, Kang, Dolacky, Ingrassia, & Ganeshan, 2013).

Ongoing efforts for improving heart failure management and reducing hospital readmission rates are profoundly noted in the literature. McLaughlin, Hoy, and Glacklin, (2015), examined a community based intervention where heart failure nurse specialists (heart failure NS) were implemented in great effort to reduce heart failure readmission rate. This was a service evaluation using primarily ordinal data, descriptive statistics of 249 patients on heart failure NS caseload. The heart failure NS provided extensive education to patients and their families about heart failure management. The teaching was ongoing and consisted of thoroughly educating the patients and/or caregiver regarding the importance of diet, medication, and exercise adherence, as well as reportable signs of decompensation. The writers revealed that frequent patient review by the heart failure NS resulted in a reduction of avoided hospital admissions. Ongoing support and guidance is a vital component in ensuring patients adheres to their treatment plan. Guzman-Clark, van Servellen, Chang, Menten, and Hahn, (2013), demonstrated this in their study which revealed that significant differences occurred between average home telemonitoring (HT) adherence, with adherence decreasing over time.

The use of technology has facilitated monumental strides in the evolution of healthcare and chronic disease management. Such technological advancements paved the way for increased patient empowerment, especially when used in the homecare setting.



The use of telemonitoring services is among the newly implemented technologies that have proven effective in remote patient monitoring in treating individuals with chronic illnesses (Suter, Suter, & Johnston, 2011). Wakefield et al. (2011), conducted a study to examine the effectiveness of telemonitoring services on treating two common chronic diseases, diabetes and hypertension. Telemonitoring was used as an in-home intervention, where the patients received close surveillance of home telehealth monitoring and nurse care management over a six- month period. Conducting an ANOVA, the writers revealed that patients with ongoing telemonitoring adherence and close surveillance by the homecare nurse, demonstrated improvement in clinical outcomes. A study conducted by Edwards, Rooshenas, and Isaacs (2016), focused on telehealth monitoring among patients with diabetes. This was a systematic review of the literature seeking to assess the prevalence of ethnic minorities in published telehealth and telemonitoring trials from 2000 to July 2015 for individuals with type 2 diabetes. Other studies were conducted aiming to describe and analyze the use of home telemonitoring systems in improving adherence for hypertension treatment management (Czaja, Chin, Arana, Nair, & Sharit, 2016; Santos, Oliveira, & Araujo, 2013). The findings in the studies, revealed that the use of telemonitoring to have positive impact among patients with hypertension.

The use of home telemonitoring services continues to make on going strides in providing support to healthcare providers who are caring for patients at home with chronic health illnesses. Radhakrishnan, Jacelon, and Roche, (2012) conducted a quantitative, retrospective study, examining associated patients' characteristics and re-hospitalization in patients with heart failure. The Chronic care model (CCM) served as

the theoretical framework for this study. The writers extracted and analyzed data from 403 Medicare patients' electronic health records from the years 2008 to 2010. The patients received home telemonitoring services for their heart failure management from one New England homecare agency. After stratifying the sample, they were then able to identify predictors associated with the increase risk of hospital readmission.

The rate of better health outcomes in patients with chronic disease relies significantly on the patient's level of adherence to their treatment plans and interventions (Roebuck, Liberman, Gemmill-Toyama, & Brennan, 2011). Patients with chronic health illnesses, such as heart failure, need ongoing support and encouragement from health care providers as well as family members and friends, to stay on the path of adherence. A study where motivational interviewing and home telemonitoring was used as an intervention to improve medication adherence among patients with the chronic illness, Multiple Sclerosis, revealed to be a promising mechanism for improving the rate of adherence among that population (Turner, Sloan, Kivlahan, & Kaselkorn, 2014). In a study conducted by Chiang, Chen, Dai, and Ho (2014), the writers sought to examine the effectiveness of telemonitoring and nursing-led transitional care among families and caregivers of heart failure patients. Using Meleis's Transition Theory to guide their study, the writer emphasized the significant impact nursing support has on reducing stressful events for patients and families upon returning home after a hospital event. Just as patients may become discouraged or fatigued by their chronic illnesses, caregivers of these individuals may also experience similar burdens. This quasi-experimental study, used Cohen's suggested criteria for comparing the means of two groups with a large

effect size and  $\alpha = 0.05$ , which suggested a sample size of 26 for each group. The sample size used in this study was 60 heart failure patients, 30 in each group. This study was conducted from May 2010 to October 2010. The data analyzed was collected from June 2010 to August 2010. The results revealed that nurse-led transitional care combining telemonitoring care and discharge planning significantly reduced family caregiver burden, improved mastery of stress related to the caregiver role, and improved family function. In conducting a systematic review of literature, they also discovered that nurses who demonstrated proactive roles in delivering heart failure education, support, and building heart failure self-care skills yielded improvement in self-care behaviors in heart failure patients. The findings in the study further emphasized that providing caregivers support fostered feelings of increased sense of securities and improvement in their mastery of stress related to the role of a heart failure caregiver.

### **Conclusion**

The review of literature demonstrated the prevalence of heart failure readmissions in the United States. Furthermore, the literature shows heart failure to be of a significant financial burden for the nation. The inability of healthcare providers and healthcare organizations to adequately manage heart failure can result in detrimental effects to the individuals with this disease. In reading the literature I found, frequent hospital readmissions, urgent care visits, and mortality were associated with poor heart failure management. Healthcare providers across the healthcare continuum have trialed interventions in various settings with great effort and hope of gaining control of heart failure disease. Multidisciplinary collaboration, social support, patient empowerment, and

use of telemonitoring services are among the approaches trialed by researchers identified in the literature that demonstrated improvement in chronic disease outcomes as well as a reduction in hospitalization associated with chronic disease exacerbation. In this study, I sought to address the prevalence of one of the most devastating chronic illnesses impacting our nation, heart failure and its' associated high hospital admission rates. Due to the lack of information in the literature, I sought to fill in the gap by examining home telemonitoring on heart failure readmissions among Hispanics, non- Hispanic Black, and non-Hispanic White patients who received homecare services from one Connecticut agency.

### **Summary**

The prevalence of heart failure hospital readmissions in the United States remains an ongoing battle for the individuals diagnosed with the illness. Healthcare providers delivering care to patients with heart failure disease have encountered significant challenges in managing the rate of heart failure hospital 30-day readmissions. Despite advancements in medical treatment, heart failure continues to remain a financial burden to the nation. Per the Centers for Disease Control and Prevention (CDC), the national cost for heart failure management is an estimated \$30.5 billion a year (2016b). In the state of Connecticut, 15% of the \$2.2 billion cardiovascular disease (CVD) expenditure, is for heart failure management (CDPH, 2011).

The Centers for Medicare and Medicaid Services (CMS) has taken charge of holding healthcare providers and organizations accountable for 30-day readmissions. This federally operated agency, provides funding to healthcare providers caring for Medicare

and Medicaid beneficiaries. CMS implemented the Hospital Readmissions Reduction Program in October 2012 as a quality initiative to reward hospitals for providing high quality services (CMS, 2016a). One measure of quality service is preventing 30-day readmissions for high-cost or high-volume conditions. Among the list of high-cost conditions, is heart failure disease.

Providers have taken multiple approaches to reduce the rate of heart failure readmissions. In the review of literature, quality improvement interventions designed to reduce heart failure readmission focused around multidisciplinary efforts and collaboration across the healthcare continuum. Quality initiatives based in the hospital, clinic, or home setting designed around collaborative approaches in effort of improving the quality of life, reducing readmissions, and reducing mortality rate associated with heart failure. The CCM served as the theoretical foundation for an array of studies aiming to improve the quality of life of individuals living with chronic diseases, such as heart failure (Coleman, Austin, Brach, & Wagner, 2009; Mackey et al., 2012). Dr. Wagner designed the CCM to be used by the multidisciplinary team to work collaboratively towards meeting the needs of the patients living with chronic illnesses (Wielawski, 2006).

Hispanics and non-Hispanic Blacks, in the United States, have a 10-20% higher 30-day heart failure readmission rate than Whites (Aseltine, Yan, Gruss, Wagner, & Katz, 2015). In the literature, researchers have taken great measures in implementing new practices and interventions in effort to reduce heart failure across all racial/ethnic groups. In this study, I aimed to fill the gap in the literature where there lacked reported knowledge about telemonitoring at home on hospital readmission among Hispanics, non-

Hispanic Blacks, and non-Hispanic Whites. The CCM served as the theoretical foundation because it is widely used in studies designed to improve the lives of individuals with chronic disease.

In Chapter 2, I introduced a review of the literature on heart failure readmissions in the United States. The literature clearly identified the gap in research related to the examination of telemonitoring at home on reducing heart failure readmissions among Hispanics, non-Hispanic Blacks, and non-Hispanic Whites. In Chapter 3, I introduce the research design and method that was used in this study. I also introduce the research questions and hypotheses. There will be a thorough discussion regarding the following: (a) population, (b) sampling, (c) data collection, (d) data analysis, (e) threats to validity, (f) ethical consideration, and (g) summary.

## Chapter 3: Research Method

### **Introduction**

Heart failure is a cardiovascular illness that is characterized by the heart's inability to pump blood normally (Torpy, Lynn, & Golub, 2011). This disease is among the leading cause of death among individuals 65 years of age nationally (Desai & Stevenson, 2012; Heron, 2013; Whittaker, Soine, & Errico, 2014). Heart failure has plagued many minority communities in the United States and is one of the major contributing factors for mortality and hospital readmissions among Hispanics and African Americans (Kelesidis, Varughese, Hourani, & Zolty, 2013). Hispanics and African Americans have an earlier onset of heart failure compared to White Americans (Thompson et al., 2011). The inability of healthcare organizations across the nation to adequately control heart failure hospitalizations and readmissions is resulting in extraordinary financial burdens. Many quality initiatives across the health care continuum have been implemented in effort to improve the quality of life, reduce readmissions, and reduce mortality rate associated with heart failure. The CCM served as the theoretical foundation for an array of studies aiming to improve the quality of life of individuals living with chronic diseases, such as heart failure (Coleman, Austin, Brach, & Wagner, 2009; Mackey et al., 2012). In Chapter 3, I introduce the research method for this study. In it, I restate the purpose of this study and provide a concise discussion of the variables, population, sampling, data collection and analysis. I conclude by discussing the potential threats to validity and the ethical considerations involved with this study.

### **Purpose**

The purpose of this retrospective, quantitative study was to determine the difference of hospital readmission between three racial/ethnic groups of patients with heart failure disease who received and did not receive home telemonitoring services. In addition to examining telemonitoring and race, I examined whether age, gender, and insurance predicted heart failure readmission. The three racial/ethnic groups examined in this study were Hispanics, non-Hispanic Blacks, and non-Hispanic Whites who received services from one homecare agency in Connecticut.

### **Research Design and Rationale**

For this study, I used a quantitative, retrospective method to examine hospital readmission of Hispanics who are on home healthcare services for the management of their chronic heart failure illness. To gain further knowledge of this prevalent issue and the use of telemonitoring on heart failure patients, I conducted a three-group comparison examining heart failure hospitalization across Hispanic, non-Hispanic Black, and non-Hispanic White patients. I used a retrospective method because it allowed me to determine the relationship between my variables. Retrospective data were collected and analyzed from one CT homecare agency to gain further insight regarding home telemonitoring on heart failure related hospital readmissions. A retrospective research design is a backwards approach to research (Campbell & Stanley, 1963; Sharma, 2015). I chose this design because a retrospective approach allowed me to examine the relational outcome of an intervention used to treat a known preexisting condition. Retrospective studies can be used for studies of smaller groups, whereas prospective studies typically



involve larger study groups. Literature on this related topic showed that a retrospective approach would be appropriate (McLaughlin, Hoy, & Glackin, 2015; Ryan et al., 2013). Researchers select this design to look back and examine interventions or treatments in relation to an outcome. I selected this design to examine home telemonitoring on hospital readmission related to heart failure exacerbation among patients of different racial/ethnic backgrounds.

### **Variables**

The purpose of this study was to determine the difference of hospital readmission between three racial/ethnic groups of patients with heart failure disease who received and did not receive home telemonitoring services. The independent variable was race: Hispanics, non-Hispanic Blacks, and non-Hispanic Whites. In addition to examining telemonitoring and race, I examined whether age, gender, and insurance predicted heart failure readmission. The dependent variable was hospital readmission.

### **Methodology**

I conducted a retrospective, quantitative study to answer the research questions. This study involved an explicit focus on the effects of telemonitoring as a nursing intervention on hospital readmission rates among patients who received homecare services from one homecare agency in Connecticut during the period of January 1, 2012 through June 30, 2017. Retrospective data was collected to examine whether the use of home telemonitoring service on patients' hospital readmission differed across race. In this section, I discuss the study's population, sample frame, strategies and procedures, and data collection and analysis.

## **Population and Setting**

The targeted population for this study was Hispanics, non-Hispanic Blacks, and non-Hispanic White adults, age  $\geq 18$ , with heart failure disease who received homecare services from one Connecticut homecare agency between January 1, 2012 and June 30, 2017. This homecare agency implemented telemonitoring services in 2008 as a new intervention to improve heart failure outcomes. The use of the telemonitoring equipment in the home allowed for in-home daily monitoring of the patients' vital signs and weight. The patients were taught how to use the digital equipment, which entailed putting on the blood pressure cuff, stepping on a digital scale, and submitting the results to the agency electronically. I extracted and de-identified the patients' information from electronic health records during the study's time frame. The selected homecare agency services many Hispanic patients because its service area includes the city of Hartford. There are approximately 32,576 adult Hispanics in Hartford who account for over 40% of the city's population (AreaConnect, 2015; United States Census Bureau, 2015). Hispanics are one of the largest, and fastest growing, minority groups in the United States, averaging 17% (55 million) of the country's population (U.S. Census Bureau, 2015). According to the CDC (2015), 11.3% of adult Hispanics have been diagnosed with heart disease. The percentage of adult Hispanics receiving homecare services with a primary diagnosis of heart failure is 9.3% (CDC, 2015). In Hartford, there are an estimated 2,931 adult Hispanics receiving homecare services for heart failure.

### **Sampling and Sampling Procedures**

A sampling frame consists of a complete list of all the sample units of population (Frankfort-Nachmias & Nachmias, 2008). To draw a sample that represents the adult patients with heart failure for this study, I composed the following sample frame. This sample frame lists the inclusion and exclusion criteria I considered for data extraction for this study. The sample population was obtained from electronic health records from one homecare agency in Connecticut. The inclusion criteria were:

- Adults  $\geq 18$
- Are Hispanics, Non-Hispanic Whites, and Non-Hispanic Blacks
- Primary diagnosis of heart failure
- Received homecare services for heart failure during the period of January 1, 2012- June 30, 2017
- Patient on telemonitoring with primary diagnosis of heart failure
- Patients who set up with telemonitoring equipment at the start or resumption of services for heart failure
- Patients who declined home telemonitoring with diagnosis of heart failure

The exclusion criteria were:

- Patients on telemonitoring for treatment other than heart failure
- Patients  $< 18$  years of age

### **Sample Size**

Quantitative research allows researchers to conduct a controlled study that produce numerical findings so that researchers can then make a generalization of a

population (Grove, Burns, & Gray, 2013). Obtaining an adequate sample size is essential for generalizability. To determine an adequate sample size, investigators need to determine the level of accuracy expected of their sample (Frankfort-Nachmias & Nachmias, 2008). According to Grove, Burns, and Gray (2013), the best method for determining sample size is power analysis. The minimum acceptable power is 0.80 or 80%. Also, the effect size (ES) of the presences of a phenomenon should be considered. According to Buchner, Faul, and Erdfelder (2016), using the G\*Power software is a simple way of computing sample size.

A priori power analysis is when a researcher decides on the acceptable alpha and beta levels for the study. In addition, the investigator has also established the size of the effect that is expected at the completion of the study. Once these elements have been determined and the type of statistical analysis that is going to be performed is known, then one can conduct an a priori power analysis. A priori power analysis computes the required sample size, given alpha level, power, and effect size (Buchner, Faul, & Erdfelder, 2016).

In considering the above information, I used the G \*Power program to determine the sample size for this study. In this study, a three-group comparison analysis was conducted. The inputs in determining an adequate sample size was based on Cohen's (1992) advised criteria for comparing group means. To reduce the chance of conducting a Type I error, the significance criterion, alpha, was 0.05. Also, to minimize the risk of a Type II error, the power would not be less than 0.80. Using the G \*Power program to compute a three-group, one-way, two-tailed ANOVA with a large effect size (.40), alpha

0.05, and power analysis of 0.80, the calculated total sample size was 66, or 22 per group. I also computed the sample size needed to conduct a multiple logistic regression using the G\*Power program. The calculated sample size was 43. This sample size was based on one main predictor variable, race/ethnicity. Additional predictor variables of interest for this study were the patient's age, gender, and insurance.

### **Sampling Strategy**

There are various sampling methods that researchers use to obtain their subjects or participants. The sampling method used will affect the researcher's ability to make a generalization regarding a population. There are two sampling strategies, probability and nonprobability sampling. The four common probability sampling designs are simple random sampling, systematic sampling, stratified sampling, and cluster. There are three common nonprobability sampling designs: convenience, purposive (purposeful), and quota sampling (Frankfort-Nachmias & Nachmias, 2008). Probability sampling strategies produce a sample that is more representative of the population of interest and allow for the potential for generalizability. Although this is a major attribute, there are occasions and circumstances where nonprobability sampling is warranted.

I used purposive sampling because the sample was collected from already performed homecare visits. The records were purposively pulled based on meeting the study's criteria. The inclusion criteria were specific to only records of patients 18 years of age or greater who received homecare nursing services rendered from January 1, 2012 through June 30, 2017, who had records with primary diagnosis of heart failure, and who were Hispanic, non-Hispanic White, and non-Hispanic Black patients.

## **Data Analysis Plan**

This quantitative study entails the collection of retrospective data obtained from electronic health records from one Connecticut homecare agency. Archived data were obtained based on the identification of meeting the inclusion criteria as identified above and de-identified to maintain the subjects' anonymity. The software used for data collection, storage, and analysis was IBM SPSS v23. IBM SPSS is a statistical program that allows for the safe storage and analysis of quantitative data (Green & Salkind, 2014). Data cleaning and screening procedure consists of thorough preparation. To avoid data management issues, various considerations were made prior to collecting data.

Prior to obtaining data, I created a code book for the dataset. The codebook consisted of the variable names, variable labels, and value labels. Keeping data organized is imperative. Prior to analyzing the data, I also created an analysis plan. This plan included plans for data cleaning, variable modifications and hypotheses testing, tables, graphs, and desired figures to display the data. Lastly, but most importantly, I considered how to maintain the anonymity and confidentiality of the personal information I gathered.

## **Research Questions and Hypotheses**

### **Research Question 1**

Is there a difference in heart failure hospital readmission for adult Hispanics who received or did not receive telemonitoring services by one homecare agency in Connecticut compared to non-Hispanic Whites or non-Hispanic Blacks?

$H_01$ : There will be no difference in heart failure hospital readmission for adult Hispanics who received or did not receive telemonitoring services by one homecare agency in Connecticut compared to non-Hispanic Whites or non-Hispanic Blacks.

$H_a1$ : There will be a difference in heart failure hospital readmission for adult Hispanics who received or did not receive telemonitoring services by one homecare agency in Connecticut compared to non- Hispanic Whites or non-Hispanic Blacks.

## **Research Question 2**

Do race, telemonitoring, age, gender, and insurance predict heart failure readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received services by one homecare agency in Connecticut?

$H_02$ : Race, telemonitoring, age, gender, and insurance are not predictors of heart failure readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received homecare services by one agency in Connecticut.

$H_a2$ : Race, telemonitoring, age, gender, and insurance are predictors of heart failure readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received homecare services by one agency in Connecticut.

## **Analysis Plan**

The above is a restatement of the proposed research question and hypothesis. The analysis process consisted of cleansing the data. Cleansing the data of missing values is extremely important because SPSS cannot interpret missing values. After cleansing the data, the initial plan was to carry out a series of One -Way ANOVA to test the significance of the groups' differences, test the hypothesis, and make inferences about the

relationships between the independent variable, home telemonitoring services, and the dependent variable, hospital readmission rates. The One-Way ANOVA would have allowed me to compare the mean scores from all three groups on one independent variable. I planned to use the One-Way ANOVA to test my hypothesis for the first research question where I was seeking to determine whether there was a difference of heart failure readmissions among the three groups, Hispanics, non-Hispanic Blacks, and non-Hispanic Whites, who received or did not receive home telemonitoring services.

The second research question of my study sought to determine the predictors of hospital readmission across three racial/ethnic groups. To test the proposed hypothesis, I planned to conduct a Pearson Correlation analysis. This type of analysis is used to describe whether a relationship between two variables exist and to describe the directional relationship. That is, whether the relationship between the variables is positive or negative (Pallant, 2013). Pearson correlation allows for measuring the degree and the direction of the linear relationship between variables (Green & Salkind, 2014). I have several variables to consider. Therefore, I planned to conduct a correlation and multiple regression analyses. The main predictor variable was race/ethnicity. The other predictor variables of interest for this study were the patients' age, gender, and insurance.

### **Threats to Validity**

Explicit disclosure of any potential threats to a study is vital. Such consideration for identifying internal and external threats of an experiment and design can increase the study's validity (Creswell, 2009). The disclosure of internal threats is extremely pertinent as they may significantly impact the outcomes. Internal threats to be disclosed in this



study are patients' comorbidities and the length the patient remained on telemonitoring services. External threats may include the patient's marital status and support system.

### **Ethical Consideration**

Researchers must be aware of any ethical factors that may arise in a study. Preparing for a research study entails recognizing your biases and anticipating the possibility of ethical conflicts to arise (Creswell, 2009). To be successful at conducting research, one must go into the study with an open mind and a commitment to complete the study without incorporating bias to maintain the integrity of the study. For myself, being of Hispanic descent, I ensure not to bring my own experiences and beliefs into the study.

The concept of avoiding bias in research may appear simple but I can see the challenges one may face in trying to maintain an unbiased perspective throughout their study. Maintaining bias free perspective may reduce any potential ethical dilemmas that may arise in a study. When writing the findings, there are some key tips of ensuring bias free language in the writing. (The American Psychological Association [APA], 2010). Improper writing can introduce ethical challenges to a study. There are other ethical considerations as well.

When conducting a research study that contains personal data of patients, there are many ethical considerations to consider. As a researcher, I ensured to maintain the anonymity and confidentiality of the patients by de-identifying their information. The IRB will expect that I maintain the anonymity of the patients' records. Should there be actions that breach patients' privacy or introduce any form of harm to the patient,

regardless if it is unintentionally done, this will introduce great degrees of ethical dilemma to a research study. Although I was not required to obtain consents, I was responsible for ensuring the protection and security of the information I collected.

### **Summary**

In Chapter 3, I introduced the design and methodology planned to be used in this study. I conducted a quantitative study which entailed gathering retrospective data from one homecare agency's electronic health record. After ensuring the patients' information were de-identified, data cleaning, reduction of threats of validity, and taking into consideration to follow ethical procedures, a thorough statistical analysis was carried out. For this research study, I initially planned to conduct a One-Way ANOVA to test the significance of the group differences, test the hypotheses, and make inferences about the relationships between home telemonitoring services and hospital readmission across racial/ethnic groups. Statistical analyses were carried out to test my hypothesis for the first research question. I also planned to conduct a correlation and multiple logistic regression analyses to examine my second question where I was seeking to determine the additional predictor variables of hospital readmission across three racial/ethnic groups with the consideration of the main predictor variable, race/ethnicity. In chapter 4, the data analysis and results will be shared.

## Chapter 4: Results

### **Introduction**

The purpose of this study was to determine if there was a difference in the number of hospital readmissions between Hispanics, non-Hispanic Whites, and non-Hispanic Black patients with heart failure disease who received or did not receive home telemonitoring services from one homecare agency in Connecticut. My first research question was structured to determine the difference in heart failure hospital readmission for adult Hispanics who received or did not receive telemonitoring services by one homecare agency in Connecticut compared to non-Hispanic Whites or non-Hispanic Blacks who also did or did not receive home telemonitoring services. The second part of the purpose was to determine if race, telemonitoring, age, gender, and insurance would predict heart failure readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received services by one homecare agency in Connecticut.

In this chapter, I describe the results of the data analysis I conducted to examine the effect of home telemonitoring services on hospital readmission across three racial/ethnic groups of patients with heart failure disease. I also provide a detailed description of the data collection process. Specifically, I discuss the purpose of the study, the research questions and hypotheses, data collection procedures, and results. I also summarize the findings in relation to the research questions. In this chapter, I use tables to illustrate the various analysis results.

### **Purpose of the Study and Research Questions with Hypotheses**

The purpose of this retrospective, quantitative study was to determine the difference of hospital readmission between three racial/ethnic groups of patients with heart failure disease who received or did not receive home telemonitoring services. In addition to examining readmission, telemonitoring status, and race/ethnicity, I examined whether age, gender, and insurance predicted heart failure readmission. The three racial/ethnic groups examined in this study were Hispanics, non-Hispanic Blacks, and non-Hispanic Whites who received services from one homecare agency in Connecticut.

### **Research Questions and Hypotheses**

Research Question 1: Is there a difference in heart failure hospital readmission for adult Hispanics who received or did not receive telemonitoring services by one homecare agency in Connecticut compared to non- Hispanic Whites or non-Hispanic Blacks?

$H_0$ 1: There will be no difference in heart failure hospital readmission for adult Hispanics who received or did not receive telemonitoring services by one homecare agency in Connecticut compared to non-Hispanic Whites or non-Hispanic Blacks.

$H_a$ 1: There will be a difference in heart failure hospital readmission for adult Hispanics who received or did not receive telemonitoring services by one homecare agency in Connecticut compared to non- Hispanic Whites or non-Hispanic Blacks.

Research Question 2: Do race, telemonitoring, age, gender, and insurance predict heart failure readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received services by one homecare agency in Connecticut?

$H_0$ 2: Race, telemonitoring, age, gender, and insurance are not predictors of heart failure readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received homecare services by one agency in Connecticut.

$H_a$ 2: Race, telemonitoring, age, gender, and insurance are predictors of heart failure readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received homecare services by one agency in Connecticut.

### **Data Collection**

I obtained retrospective data from electronic health records during the period of January 1, 2012 to June 30, 2017. The actual data collection occurred on July 28, 2017 to ensure inclusion of data through June 30, 2017. I collected the data using the inclusion criteria outlined in Chapter 3. The data collection process differed slightly than I had initially planned (see Chapter 3) in order to obtain an adequate sample size and ensure the inclusion of patients who did not agree to be telemonitored. All heart failure patients were offered home telemonitoring services. The sample size included records of patients who agreed to home telemonitoring and who did not agree to home telemonitoring services. I drew 69 electronic health records of patients who had heart failure and received telemonitoring services and 69 charts of patients who had heart failure and did not receive telemonitoring from the data base. The use of a non-probability sampling method limits generalizability, therefore I adjusted the sample size using the G\*Power software to obtain the minimal required sample size to conduct a logistic regression analysis. Ensuring an adequate sample size reduced the threats to external validity. The

data obtained were de-identified to ensure the protection and anonymity the patients' information.

### **Data Characteristics of Sample**

All data were obtained from electronic health records of heart failure patients who received homecare services from one homecare agency in Connecticut. The inclusion criteria consisted of patients who received or did not receive telemonitoring services, adult, 18 years of age or greater, Hispanic, non-Hispanic White, and non-Hispanic Black patients with a primary and/or secondary diagnosis of heart failure.

### **Data Analysis Procedures**

I analyzed data from the study using IBM SPSS v23. The analytic plan from Chapter 3 included the use of a one-way ANOVA, correlation, and multiple regression analyses, given that readmission data were expected to be continuous. A correlation analysis was not appropriate as I was seeking to examine the outcome of home telemonitoring. Because the dependent variable readmission was dichotomous (readmitted or not readmitted), I could not use ANOVA because it requires a continuous dependent variable (Field, 2013). On the other hand, logistic regression has a requirement that the dependent variable be dichotomous (Field, 2013). Therefore, a simple logistic regression was an appropriate analysis to use to investigate Research Question 1, and I used a multiple logistic regression for Research Question 2. To answer Research Question 1 where telemonitoring was the only predictor of interest, I carried out a simple logistic regression. A simple regression is used when there is one predictor variable (Field, 2013). To determine how the predictor variables, race/ethnicity, age, gender, and

insurance predicted or explained readmission of patients with heart failure on home telemonitoring for Research Question 2, I conducted a multiple logistic regression, which is appropriate when there are several predictors in the model to be examined. The two types of regression analyses were useful in determining how hospital readmission of heart failure patients at home on homecare services differed by telemonitoring status, race/ethnicity, age, gender, and insurance.

### **Results**

This section includes a comprehensive description of the results of the analysis I conducted to address the research question. There are three subcategories in this section: (a) the first subcategory is a report that contains descriptive statistics that appropriately characterize the sample, (b) the second subcategory contains an evaluation of statistical assumptions that are associated with conducting a simple and multiple logistic regression analyses, and (c) the third section contains a report of the statistical analysis findings. In this section, I provide tables to display the results of the statistical analysis carried out to address the question and hypothesis. I conducted a simple logistic regression analysis to see whether there was a difference between hospital readmission of three racial/ethnic groups who received or did not receive home telemonitoring services. A multiple logistic regression analysis was used to examine the multiple predictor variables of telemonitoring, race/ethnicity, age, gender, and insurance on hospital readmission.

#### **Description of Sample**

The sample consisted of 138 electronic health records of patients with heart failure who received homecare services. I divided the records into the three groups:

Hispanics, non-Hispanic Whites, and non-Hispanic Blacks. Three groups of 46 patient records ( $N = 138$ ), made up the sample. The inclusion criteria for the electronic health records were: patients who received or did not receive home telemonitoring services; adults 18 years of age or greater; Hispanic, Non-Hispanic White, and Non-Hispanic Black patients with a primary diagnosis of heart failure; patients who received homecare services for heart failure during the period of January 1, 2012- June 30, 2017; and patients who agreed to and did not agree to the use of telemonitoring services for heart failure management at home. The three groups were labeled as: Hispanic, non-Hispanic White, and non-Hispanic Black. The samples were evenly divided; 33.3% of the sample records were Hispanic, 33.3% were non-Hispanic Whites, and 33.3% were non-Hispanic Blacks (see Table 1), with a median age of 78.5 years old (see Table 2). The youngest age was 38 years old, and the oldest was 99 years old. Seventy-one percent were females and 29% were male (see Table 3). Of the 138 patients, 80.4% had traditional Medicare or Medicare Advantage, and 19.6% had Connecticut Medicaid (see Table 4). Half the sample (50%) were patients who received telemonitoring services, and half (50%) did not receive telemonitoring (see Table 5).



Table 1

*Race*

Race	Frequency	Percentage
Hispanic	46	33.3
White	46	33.3
Black	46	33.3
Total	138	100.0

Table 2

*Age*

<i>N</i>	138
Median	78.50
Minimum	38
Maximum	99

Table 3

*Gender*

Gender	Frequency	Percent
Female	98	71.0
Male	40	29.0
Total	138	100.0

Table 4

*Insurance*

Insurance	Frequency	Percent
Medicare	111	80.4
Medicaid	27	19.6
Total	138	100.0

Table 5

*Telemonitor*

Telemonitor	Frequency	Percent
No	69	50.0
Yes	69	50.0
Total	138	100.0

**Evaluation of Statistical Assumptions**

The dependent variable for this study was binary in nature, for this reason there was a slight deviation from the initial plan. Therefore, an alternative technique, simple logistic regression, was conducted to answer question one which fulfilled the requirements for having a single dichotomous dependent variable. A simple logistic regression is used when there is one predictor variable of interest (Field, 2013). This analysis was used to answer research question one as there was only one predictor variable, telemonitoring. However, to answer research question two, I was able to conduct a multiple logistic regression analysis as planned.

Examining binary dependent variables is supported by a logistic regression as this analysis is used to predict the probability that an observation falls into one of two categories of the dependent variable (Field, 2013). The independent variable could be categorical or continuous. A simple logistic regression is limited to a single independent variable and a single dichotomous dependent variable. Whereas, a multiple logistic regression can be used when there is more than one independent variable to be examined. Research question one this study examined one predictor variable, telemonitoring, and one dependent dichotomous variable, readmission (yes or no). Research question two

focused on analyzing multiple predictor variables of race, telemonitoring, age, gender, and insurance.

The assumptions for this study were in accordance to conducting binary logistic regression analyses. The model variables should be tested for goodness of fit which should demonstrate the model to be a good fit. The first assumption to be filled is that the dependent variable is dichotomous. Secondly, there must be at least one independent variable, which could be categorical or continuous. There are no assumptions regarding the distribution of scores for the predictor variables in logistic analysis (Pallant, 2013). There are assumptions of linearity and independence of error (Field, 2013). Linearity is the assumption that there is a linear relationship between any continuous predictor and the log of the outcome variable (Field). In this study, the only continuous variable was age. The test for independence of errors is an assumption that the error of each observation is independent.

The first two assumptions were met as this study had multiple independent variables, which were either categorical or continuous, and the dependent variable was dichotomous. The following tests were conducted: (a) test for linearity and (2) test for independence of errors. In conducting a logistic regression analysis, it is assumed that there is a linear relationship between the continuous variable and the logit of the dependent variable (Field, 2013). This assumption can be tested by examining the interactions between the predictor and its log transformation. Any interactions that reveal significance, indicates the assumption of linearity is violated. The continuous predictor variable for this study was age, the other predictors were categorical. Age and its log

transformation were tested for significant interactions. The output produced in testing this assumption of linearity revealed a significance value of greater than 0.05 (see appendix A). Therefore, the assumption of linearity was not violated. In testing the assumption of independent errors, the Durbin-Watson outcome of 2.01, which is close to 2, also indicated this assumption was not violated (see appendix B). This finding was significant because this indicates that the variance was not larger than expected from the model so this assumption was not violated. Over dispersion can lead to falsely deemed significance or make over confident predictions about the relationship between the variables and the outcomes (Field). For this reason, it was imperative to investigate that there were no such violations prior to proceeding with my statistical analyses.

### **Statistical Analysis Findings**

My first research question for this study was to determine if there is a difference of hospital readmission rate for Hispanic heart failure patients who received or did not receive telemonitoring services by one home care agency in Connecticut compared to non-Hispanic White or non-Hispanic Black patients. The second research question asks if race, telemonitoring, age, gender, and insurance predict heart failure hospital readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received telemonitoring services by one home care agency in Connecticut.

To address the first research question, a simple logistic regression was performed to determine if there was a difference in hospital readmission across the three racial/ethnic groups of heart failure patients on home telemonitoring services against patient not on telemonitoring services. Logistic regression analyses are used when the

examined outcome is dichotomous (Field, 2013). A simple logistic regression is appropriate when investigating one predictor variable and a multiple logistic regression is used in examining multiple predictor variables on a dichotomous or binary outcome. The single predictor variable of interest for research question one was telemonitoring (Yes on tele or Not on Tele) and the dichotomous outcome was readmission (Yes readmitted or Not readmitted).

To address the second research question, a multiple regression was performed to examine all predictors of hospital readmission of heart failure patients on homecare services. The predictor variables considered in this analysis were: Race (Hispanic, non-Hispanic White, and non-Hispanic Blacks), Telemonitor (Yes or No), gender, age, and insurance (Medicare and Medicaid). The dependent variable, readmission, was dichotomous. Analyzing multiple predictors, indicated that multiple regression was the appropriate method for this question. The four assumptions examined in this study were; assumption of having a binary dependent variable, assumption of having at least one independent variable (categorical or continuous), the test for linearity, and the test for independence of error. All assumptions were met.

### **Research Question 1**

Is there a difference of heart failure hospital readmission for adult Hispanics who received or did not receive telemonitoring services by one homecare agency in Connecticut compared to non- Hispanic Whites or non-Hispanic Blacks?

$H_01$ : There will be no difference in heart failure hospital readmission for adult Hispanics who received or did not receive telemonitoring services by one homecare agency in Connecticut compared to non-Hispanic Whites or non-Hispanic Blacks.

$H_{a1}$ : There will be a difference in heart failure hospital readmission for adult Hispanics who received or did not receive telemonitoring services by one homecare agency in Connecticut compared to non- Hispanic Whites or non-Hispanic Blacks.

To answer research question one, a simple logistic regression analysis was conducted to investigate if there was a difference in heart failure readmissions for adult Hispanics compared to non-Hispanic Blacks and non- Hispanic Whites who were and were not on home telemonitoring services. The predictor variable, telemonitoring, was tested a priori to verify there was no violation of the assumption of the linearity of the logit. The predictor variable, telemonitoring, in this simple logistic regression analysis was found to contribute to the model. Table 6 shows the unstandardized Beta weight for the Constant;  $B = (-.262)$ ,  $SE = 0.421$ ,  $Wald = .389$ ,  $p > .05$ . Also displayed in Table 6 is the unstandardized Beta weight for the predictor variable:  $B = 1.304$ ,  $SE = 0.634$ ,  $Wald = 4.224$ ,  $p = .040$ . The estimated odds ratio favored an increase of nearly 4- fold [ $Exp (B) = 3.683$ , 95%  $CI (1.062, 12.771)$ ] for hospital readmission for every one-unit increase of telemonitoring. The Beta weight is a value measurement as this value indicates how strongly a predictor variable influences the dependent variable. This analysis revealed a  $Exp (B)$  of 4, which indicates that telemonitoring is a predictor of readmission among Hispanics. Hispanics who were not on telemonitoring services were 4 times more likely to be readmitted in comparison to Hispanics on home telemonitoring services.

Table 6

*Predicting Likelihood of Readmission among Hispanics*

Predicting Likelihood							95% C.I. for EXP(B)	
	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Tele	1.304	.634	4.224	1	.040	3.683	1.062	12.771
Constant	-.262	.421	.389	1	.533	.769		

After stratifying selected cases, a repeated simple logistic regression analysis was conducted to investigate if there was a relationship between Hispanics, non-Hispanic Whites, and non-Hispanic Blacks on telemonitoring services and hospital readmission. The predictor variable, telemonitoring, was tested a priori to verify there was no violation of the assumption of the linearity of the logit. The predictor variable, telemonitoring, in the second simple logistic regression analysis was found to contribute to the model. Table 7 shows the unstandardized Beta weight for the Constant;  $B = (-.174)$ ,  $SE = 0.296$ ,  $Wald = .347$ ,  $p > .05$ . Also displayed in Table 7 is the unstandardized Beta weight for the predictor variable:  $B = 6.16$ ,  $SE = .423$ ,  $Wald = 2.122$ ,  $p = .15$ . The estimated odds ratio favored an increase of nearly 85% [ $Exp(B) = 1.852$ , 95%  $CI (.808, 4.243)$ ] for hospital readmission for every one-unit increase of telemonitoring. This analysis revealed telemonitoring is not a significant predictor of readmission among non-Hispanic Whites and non-Hispanic Blacks.

Table 7

*Predicting Likelihood of Readmission*

Predicting Likelihood							95% C.I. for EXP(B)	
	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Tele	.616	.423	2.122	1	.145	1.852	.808	4.243
Constant	-.174	.296	.347	1	.556	.840		

Another important output to mention is the Nagelkerke R squared goodness-of-fit test. This test provides data regarding the usefulness of the model (Pallant, 2013). A goodness-of-fit test reveals if there are discrepancies between the observed data and the expected values. The scale for Nagelkerke R squared ranges from a minimum value of 0 to a maximum value of 1. In conducting the tests for goodness-of-fit, the model for Hispanics and telemonitoring revealed  $R_2=.125$ , shown in Table 8. The Nagelkerke R squared goodness-of-fit test for non-Hispanic Whites and non-Hispanic Blacks and telemonitoring was  $R_2= .031$ , shown in Table 9. In comparing both models, the model summary for Hispanics showed improvement indicating that model to be a better fit as the Nagelkerke R squared for Hispanics was closer to the value of 1.

Table 8

*Hispanics on Telemonitoring Model Summary*

Model	
-2 Log likelihood	Nagelkerke R Square
57.895 <sup>a</sup>	.125



Table 9

*Non-Hispanic Whites and Non-Hispanic Blacks on Telemonitoring Model Summary*

Model	
-2 Log likelihood	Nagelkerke R Square
124.999 <sup>a</sup>	.031

**Research Question 2**

Do race, telemonitoring, age, gender, and insurance predict heart failure readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received services by one homecare agency in Connecticut?

$H_02$  Race, telemonitoring, age, gender, and insurance are not predictors of heart failure readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received homecare services by one agency in Connecticut.

$H_{a2}$ : Race, telemonitoring, age, gender, and insurance are predictors of heart failure readmission for adult Hispanic, non-Hispanic White, and non-Hispanic Black patients who received homecare services by one agency in Connecticut.

A multiple logistic regression analysis was conducted to investigate if race, telemonitoring services, age, gender, and insurance; factors that predict if a person with heart failure disease will be readmitted to the hospital. The outcome of interest was hospital readmission. The possible predictor variables were: race, telemonitoring service, age, gender and insurance (see appendices C & D for classifications and categorical

codings). The Hosmer-Lemeshow goodness-of-fit is another test used in logistic regression models to investigate the model fit of the variables. This test also reveals the discrepancies between the observed values and the expected values. The Hosmer-Lemeshow goodness-of-fit test for this study revealed non-significance ( $p > .05$ ), indicating the model is correctly specified as shown in Table 10. Additionally, Table 11 displays the  $-2 \log Likelihood = 177.070$  and the *Nagelkerke R squared* = .119. This model with all predictor variables revealed a good fit as the Nagelkerke R squared value was close to 1.

Table 10

*Hosmer and Lemeshow Test*

Step	Chi-square	df	Sig.
1	5.970	8	.651

Table 11

*Model Summary*

-2 Log likelihood	Nagelkerke R Square
177.070 <sup>a</sup>	.119

Table 12 displays the predictor variables race, age, gender, and insurance not significant ( $p > .05$ ), however, the predictor variable telemonitoring was found to be significant ( $p < .05$ ). Controlling for race, age, gender, and insurance, the predictor variable, telemonitoring, in the multiple logistic regression analysis was found to

contribute to the model. The unstandardized  $B = .984$ ,  $SE = .369$ ,  $Wald = 7.114$ ,  $p = .008$ .

The estimated odds ratio favored a positive relationship of nearly 67.4% increase  $Exp(B) = 2.674$ , 95%  $CI(1.298, 5.510)$  for every one-unit increase of telemonitoring services.

The odds ratio for Race (1) non-Hispanic Whites ( $Exp(B) = 1.26$ ,  $CI_{0.95} = [.51, 3.10]$ ) and Race (2) non-Hispanic Blacks  $Exp(B) = .567$ ,  $CI_{0.95} = [.24, 1.34]$ ) indicates that Whites are 26% and non-Hispanic Blacks are 56.7% times more likely to be readmitted in comparison to reference group of Hispanics.

The odds ratio for Gender (1) Male ( $Exp(B) = 1.16$ ,  $CI_{0.95} = [.53, 2.55]$ ). This ratio indicates that the odds of males to be readmitted to 16% times greater than females being readmitted. The odds ratio for Insurance (1) Medicaid ( $Exp(B) = 1.38$ ,  $CI_{0.95} = [.51, 3.71]$ ) which is 38% times more likely of being readmitted compared to patients with Medicare. The final output revealed the odds ratio for Age ( $Exp(B) = .97$ ,  $CI_{0.95} = [.94, 1.01]$ ). The multiple logistic regression revealed race, age, gender, and insurance as non-significant predictors of readmission.

Table 12

*Predicting Likelihood of Readmission*

Regression						95% C.I. for EXP(B)		
	B	S.E.	Wald	df	Sig.	Exp(B)	Lower	Upper
Race			3.345	2	.188			
Race (1)	.233	.459	.258	1	.611	1.262	.514	3.101
Race (2)	-.567	.440	1.662	1	.197	.567	.239	1.343
Tele	-.984	.369	7.114	1	.008	.374	.181	.770
Gender(1)	.148	.402	.136	1	.712	1.160	.527	2.552

Age	-.028	.019	2.194	1	.139	.972	.937	1.009
Insurance	.324	.505	.412	1	.521	1.383	.514	3.719
Constant	1.831	1.908	.920	1	.337	6.238		

### Summary

The results of this research study will contribute to the literature by filling in the gap in the lack of studies examining hospital readmissions among adult Hispanic, non-Hispanic White, and non-Hispanic Black heart failure patients on home telemonitoring services in Connecticut. The findings of this study suggest that telemonitoring is a predictor of readmission among Hispanics but not for non-Hispanic Whites and non-Hispanic Blacks. Hospital readmissions across the three racial/ethnic groups with heart failure did not differ significantly. There was a significant difference found in telemonitoring. The probability for readmission among patients not on telemonitoring services was found to be 27% higher when compared to patients on telemonitoring. The additional predictors; age, race, gender, and insurance did not reveal significance.

In Chapter 5, I will provide a recap of the purpose and nature of the study. Also, the final chapter will consist of an interpretation of the findings, limitations of the study, and recommendations for further research study. Finally, there will be a discussion on how this study contributes to positive social change and a conclusion that will capture the key essence of the study.

## Chapter 5: Discussion, Conclusions, and Recommendations

### **Introduction**

This chapter consists of five major sections including (a) an interpretation of the findings presented in Chapter 4 with comparison to the peer-reviewed literature described in Chapter 2, (b) an explanation of the limitations of the study, (c) recommendations for further research, (d) a discussion of the study's potential implications for positive social change, and (e) a conclusion. The purpose of this study was to determine whether there is a difference between hospital readmissions for adult patients with heart failure disease receiving home telemonitoring service and patients who did not agree to the use of telemonitoring services. I examined the use of telemonitoring services compared to no telemonitoring services across three racial/ethnic groups: Hispanics, non-Hispanic Blacks, and non-Hispanic Whites who received services from one homecare agency in Connecticut. In addition to examining race and telemonitoring services, I also examined age, gender, and insurance as predictors of heart failure readmission among the three racial/ethnic groups.

This was a retrospective, quantitative study to examine hospital readmission rates of Hispanics who were on home healthcare services for management of their chronic heart failure illness. I conducted a simple logistic regression analysis examining heart failure rehospitalization across Hispanics, non-Hispanic Blacks, and non-Hispanic Whites who received and did not receive home telemonitoring services. I also conducted multiple logistic regression to investigate if race, telemonitoring services, age, gender, and insurance predict if a person with heart failure disease would be readmitted to the

hospital. I designed this study to acquire new knowledge regarding the difference in heart failure-related hospital readmissions across three racial/ethnic groups who received homecare services, and who agreed and did not agree to telemonitoring services.

### **Interpretation of Findings**

The findings of this research study contribute new knowledge to the literature, which has lacked information regarding the difference of hospital readmission rates among patients of three racial/ethnic groups who received homecare services for their heart failure disease in Connecticut. More specifically, the study showed new data on the effects telemonitoring services (or the lack thereof) have on hospital readmission among adult Hispanic, non-Hispanic White, and non-Hispanic Black heart failure patients. Several researchers have suggested that the use of home telemonitoring equipment will result in improved health outcomes, improved chronic disease management, reduction in the rate of urgent care visits, and reduction of rehospitalizations (Czaja, Chin, Arana, Nair, & Sharit, 2016); Roebuck, Liberman, Gemmill-Toyama, & Brennan, 2011; Santos, Oliveira, & Araujo, 2013). However, these researchers focused on the patients' levels of medication adherence while on home telemonitoring and did not explicitly focus on comparing the outcome of rehospitalization of Hispanics, non-Hispanic Whites, and non-Hispanic Blacks.

The results of my study show that telemonitoring is a predictor of readmission among Hispanics, but that it is not a predictor among non-Hispanic Whites or non-Hispanic Blacks. Hispanics not on telemonitoring had almost 4 times greater likelihood of readmission compared to Hispanic patients on telemonitoring. Race, age, gender, and

insurance were not significant predictors of readmission. The measured outcome was dichotomous, and the sample did not include the duration patients remained on telemonitoring. Kuo et al. (2011) suggested that understanding clinical outcomes among patients extends beyond measuring their use of telemonitoring. The findings of this study did not reveal race, age, gender, and insurance as significant predictors of hospital readmissions, which aligns with Kuo et al.'s findings that there are many other critical influences to consider when examining the use of home telemonitoring services on hospital readmissions among adult heart failure patients.

### **Hispanics with Heart Failure on Home Telemonitoring**

A key finding from the simple logistic regression analysis was that telemonitoring is a predictor of readmission among Hispanics. The unstandardized beta weight for the predictor variable was  $B = 1.304$ ,  $SE = 0.634$ ,  $Wald = 4.224$ ,  $p < .05$ . Hispanics who were not on telemonitoring services were 4 times more likely to be readmitted in comparison to Hispanics on home telemonitoring services. This finding addresses the gap in literature where knowledge is limited regarding the effects of home telemonitoring on readmission among adult Hispanic heart failure patients. Not only does this study support the literature that has shown telemonitoring is linked to optimized outcomes for patients with chronic diseases (Wakefield et al., 2011), it also shows the need for further studies to examine the use of home telemonitoring as an intervention in managing chronic diseases among Hispanics and patients of minority groups (see Edwards, Rooshenas, & Isaacs, 2016).

### **Heart Failure Readmissions and Race/Ethnicity**

Another key finding from the multiple logistic regression analysis was that race was non-significant as a predictor of readmission for Hispanics, but did reveal to be among one of the strongest predictors of hospital readmission. Non-Hispanic Whites in my study were 26.2% more likely to be readmitted, and non-Hispanic Blacks were 56.7% more likely to be readmitted than Hispanics, controlling for all other factors in the model. Results showed that Hispanics had a greater response to the use of home telemonitoring services compared to non-Hispanic Whites and non-Hispanic Blacks. In this study, Blacks had a higher readmission compared to Hispanics and Whites, which supports other researchers' findings that Blacks/African Americans have a substantially higher rate of readmission compared to Whites (Steele & Steele, 2015).

### **Heart Failure Readmissions and Home Telemonitoring**

The multiple logistic regression showed there is a significant difference,  $p = 0.01$ , in readmission of patients not on telemonitoring compared to patients on telemonitoring. The odds ratios indicate that patients not telemonitor are .37 times more likely to be readmitted. The probability for readmission among patients without telemonitoring services is 27% greater than patients on home telemonitoring services. Furthermore, telemonitoring showed significance among Hispanic heart failure patients. These findings concur with the literature that has shown the use of home telemonitoring does have a positive effect on managing chronic illnesses (Suter, Suter, & Johnston, 2011; Wakefield et al., 2011).



### **Heart Failure Readmissions and Additional Predictors**

The additional predictors of hospital readmission I examined were gender, age, and insurance. The literature has shown race, gender, and age disparities among heart failure patients in the United States (Steele & Steele, 2015). In this study, the median age for males was 77 years old and for females it was 79 years old. Of the total sample size ( $N = 138$ ), 29% were males and 71% were females (see Table 13 below). The Hispanic sample consisted of a median age of 79 years old, and comprised 21.7% males and 78.3% females (see Tables 14 & 15 below). Although gender was found to be non-significant across Hispanics, non-Hispanic Whites, and non-Hispanic Blacks ( $p > 0.05$ ), the odds ratio showed that the male heart failure patients were 1.16 times more likely to be readmitted than female heart failure patients. Also, the findings indicated that the probability of males to be readmitted was 53.7% higher than for females, supporting the literature that has shown gender disparities are of valid concern among heart failure populations. Steele and Steele (2015) described men as being at higher risk for developing heart failure than women, but their risk narrows with age.

An additional output showed that increasing age has a 50% greater association in increasing the likelihood of readmission. The literature has shown that the prevalence of heart failure disease increases among adults greater than 65 years of age (Cavalier & Sickels, 2015). The median age of the patients for this study was 78.50, which is similar to the findings of previous studies that have shown the probability of readmission increases with age and the prevalence of patients acquiring heart failure also increases with age. The gender disparities found across the three racial/ethnic groups examined in

this study were non-significant and the median age of both males and females were closely related. Therefore, I could not ascertain the relationship between gender and age on readmission.

Table 13

*Genders' Median Age, All Groups*

Females	N	Valid	98
		Missing	0
		Median	79.00
Males	N	Valid	40
		Missing	0
		Median	77.00

Table 14

*Gender Ratio of Hispanics*

	Frequency	Percent
Female	18	78.3
Male	5	21.7
Total	23	100.0

Table 15

*Median Age of Hispanics*

N	Valid	23
	Missing	0
	Median	79.0000

The odds ratio for insurance (1) indicated that patients with Medicaid are 1.38 times more likely to be readmitted compared to patients with Medicare, with a 60% greater probability for readmission among patients with Medicaid compared to those with

Medicare. The Medicaid population primarily includes individuals of low socioeconomic status and low income. The literature has shown that patients with Medicaid have limited access to preventive, acute, and follow-up treatments resulting in increasingly poorer disease management (Priest, Cantrell, Fincham, & Burch, 2011). Minority groups, compared to non-minority groups, have a higher rate of low income and poorer access to healthcare services (Graham, 2014; Zhang & Baik, 2014). I found that the minority groups in this study, Hispanics and non-Hispanic Blacks, had a larger number of patients with Medicaid when compared to non-Hispanic Whites. Approximately 24% of Hispanics and 22% of non-Hispanic Blacks were found to have Medicaid, whereas only 13% of non-Hispanic Whites had Medicaid (see Table 16 below). The findings in this study are similar to those in other studies that have consistently shown there are many disparities among the Medicaid population, which can result in poorer disease control and ultimately higher readmissions. Additionally, the Medicaid population in this study was larger among Hispanics and non-Hispanic Blacks, which also resonates with the literature (Graham, 2014; Zhang & Baik, 2014).

Table 16

*Medicaid Population*

Race/Ethnicity			Frequency	Percent
Hispanic	Valid	Medicare	35	76.1
		Medicaid	11	23.9
		Total	46	100.0
White	Valid	Medicare	40	87.0
		Medicaid	6	13.0
		Total	46	100.0
Black	Valid	Medicare	36	78.3
		Medicaid	10	21.7
		Total	46	100.0

**Limitations of the Study**

There were several limitations of this study. The sampling strategy used in this study was purposive (purposeful), as the sample was collected from electronic health records from one homecare agency in Connecticut. This sampling strategy was warranted because this was a retrospective study. Purposeful sampling reduces the allowance for generalizability as it is a nonprobability strategy. For this reason, the findings of this study cannot be generalized as a true estimate representation of the population. Another significant limitation was that the data collected regarding readmission was dichotomous. Due to having a binary outcome, I could not conduct a parametric analysis, such as the one-way ANOVA which is a more robust test. This study did not have data regarding the length on telemonitoring services for means of comparison. For this reason, the effects of the use telemonitoring on heart failure readmissions could be determined.

### **Recommendations for Future Research**

The following recommendations for future research are based on the findings in this study. Using a probability sampling strategy, increasing the sampling size, and extending the search to obtain data from other homecare agencies in Connecticut could increase the generalizability of the population. The dependent variable should be continuous to allow for more robust testing. To measure the relationship of telemonitoring among adult heart failure patients on hospital readmission, comparative data should be collected. Obtaining data regarding the duration patients remained on telemonitoring services for heart failure management could then be tested for the effects on hospital readmissions. Based on the literature review in Chapter 2, it is also recommended to consider examining other factors such as the patients' level of adherence to telemonitoring and level of adherence to prescribed medications, diet, and follow up appointments. Also, future studies may want to consider obtaining information regarding the patients' comorbidities. Heart failure patients, who have other existing comorbidities, are at greater risk for hospital readmissions.

### **Implication for Positive Social Change**

The findings from this study may promote positive social change for healthcare providers striving to find an effective intervention in reducing heart failure hospital readmissions among adult Hispanics and patients of another race and ethnicity. Healthcare organizations globally struggle with reducing the rate of heart failure readmissions (Fleming & Kociol, 2014). Home care agencies and healthcare providers in Connecticut could work collaboratively in pursuit of conquering the issue of poorly

controlled heart failure disease management that is among the leading causes for hospitalization in this state. Although the literature shows the use of telemonitoring to be effective in optimizing chronic disease management and reducing hospitalization, in this study I add to the literature as I revealed that telemonitoring alone may not be as successful without accounting for additional factors.

In this study, I revealed the social implications for healthcare providers working towards reducing heart failure readmissions. Reducing heart failure readmission rates are multifactorial, therefore multidisciplinary approaches are warranted in ensuring the optimization of outcomes among the heart failure population. The chronic care model (CCM) offers multidisciplinary and multisystem approaches to optimizing chronic disease management (Wielawski, 2006). Community resources, organizational support, self-management support, delivery system design, and clinical information system are the six essential interrelated systems of the CCM healthcare organizations and providers can adopt to work collaboratively to reduce heart failure readmissions.

The implications of social change revealed by this study recommend a collaborative and multi-systems approach to reducing heart failure readmission among Hispanics, non-Hispanic Whites, and non-Hispanic Blacks. Furthermore, the findings of this study recommend that healthcare practices and providers consider the intervention of home telemonitoring as an adjunct to homecare nursing services. This study concurs with Fleming and Kociol (2014) that interventions focused on improving the management of heart failure disease can reduce heart failure readmissions. The use of home

telemonitoring service is an intervention that has significant potential to reducing heart failure readmissions among adult Hispanics globally.

### **Conclusion**

In this study, my goal was to gain further understanding of the use of home telemonitoring as an intervention in managing heart failure related hospitalization among three racial/ethnic groups. I achieved my goal and obtained further knowledge on the use of home telemonitoring for heart failure patients who received home nursing services from one homecare agency in Connecticut. The findings of this study provided insight regarding managing patients at home with heart failure disease. This newly found knowledge is valuable information because it allows home care agencies and health care providers of heart failure patients to understand that the management of these populations' readmissions is multifactorial. Telemonitoring alone will not reduce hospital readmissions among heart failure patients. Therefore, careful attention should be applied to educating home care nurses and health care providers in considering the management of other factors to maximize the outcome of home telemonitoring for heart failure patients.

## References

- AreaConnect. (2015). *Hartford Connecticut population and demographics resources*. Retrieved from [hartford.areaconnect.com/statistics.htm](http://hartford.areaconnect.com/statistics.htm)
- Arungwa, O. T. (2014). Effects of communication of nurse- patient relationship in National Orthopaedic Hospital, Igbobi, Lagos. *West African Journal of Nursing*, 25(2), 37-49. Retrieved from [www.wacn-online.com](http://www.wacn-online.com)
- Aseltine, R. H., Yan, J., Gruss, C. B., Wagner, C. D., & Katz, M. (2015). Connecticut hospital readmissions related to chest pain and heart failure: Differences by race, ethnicity, and payer. *Connecticut Medicine*, 79(2), 69-76. Retrieved from [https://csms.org/wp-content/uploads/2015/02/CT-Hospital-Readmissions\\_ConnMed\\_Feb2015.pdf](https://csms.org/wp-content/uploads/2015/02/CT-Hospital-Readmissions_ConnMed_Feb2015.pdf)
- Bagchi, A. D., Stewart, K., McLaughlin, C., Higgins, P., & Croghan, T. (2011). Treatment and outcomes for congestive heart failure by race/ethnicity in Tricare. *Medical Care*, 49(5), 489-495. Retrieved from [www.lww-medicalcare.com](http://www.lww-medicalcare.com)
- Baptista, D. R., Wiens, A., Pontarolo, R., Regis, L., Reis, T., Christine, W., & Januário Correr, C. (2016). The chronic care model for type 2 diabetes: A systematic review. *Diabetology & Metabolic Syndrome*, 8(7), 1-7. doi:10.1186/s13098-015-0119-z
- Barr, V. J., Marin-Link, B., Underhill, L., Dotts, A., Ravensdale, D., & Salivaras, S. (2003). The expanded chronic care model: An integration of concepts and strategies for population health promotion and the chronic care model. *Healthcare Quarterly*, 7(1), 73-82. doi:10.12927/hcq.2003.16763



- Bohnenkamp, S., Pelton, N., Rishel, C. J., & Kurtin, S. (2014). Implementing evidence-based practice using an interprofessional team approach: Part two. *Oncology Nursing Forum*, 41(5), 548-550. doi: 10.1188/14.ONF.548-550
- Bradley, E. H., Curry, L., Horwitz, L. I., Sipsma, H., Wang, Y., Walsh, M. N., . . . Krumholz, H. M. (2013). Hospital strategies associated with 30-day readmission rates. *Circulation: Cardiovascular Quality and Outcomes*, 6, 444-450. doi:10.1161/CIRCOUTCOMES.111.000101
- Brauser, D. (2017). *CDC: Heart-failure–related mortality rate climbs after decade-long decrease*. Retrieved from <http://www.medscape.com/viewarticle/856704>
- Bruin, S. R., Heijink, Richard, L. L., Struijs, J. N., & Baan, C. A. (2011). Impact of disease management programs on healthcare expenditures for patients with diabetes, depression, heart failure or chronic obstructive pulmonary disease: A systematic review of the literature. *Health Policy*, 101(2), 105–121. doi:10.1016/j.healthpol.2011.03.006
- Buchner, A., Faul, F., & Erdfelder, E. (2016) *G\*Power*. Retrieved from <http://www.gpower.hhu.de>
- Bui, A. L., & Fonarow, G. C. (2012). Home monitoring for heart failure management. *Journal of the American College of Cardiology*, 59(2), 97-104. doi:10.1016/j.jacc.2011.09.044
- Butler, J., & Kalogeropoulos, A. (2012). Hospital strategies to reduce heart failure readmissions: Where is the evidence? *Journal of the American College of Cardiology*, 60(7), 615-617 . doi:10.1016/j.jacc.2012.03.066

- Campbell, D. T., & Stanley, J. C. (1963). *Experimental and quasi-experimental designs for research*. Boston, MA: Houghton Mifflin.
- Casper, M., Nwaise, I., Croft, J. B., Hong, Y., Fang, J., & Greer, S. (2010). Geographic disparities in heart failure hospitalization rates among Medicare beneficiaries. *Journal of the American College of Cardiology*, 55(4), 294-299. doi:10.1016/j.jacc.2009.10.021
- Cavalier, D. K., & Sickels, L. P. (2015). The fundamentals of reducing heart failure readmissions. *Nursing Management*, 46(11), 16-22. doi:10.1097/01.NUMA.0000472762.57989.79
- Centers for Disease Control and Prevention. (2017). *Heart failure fact sheet*. Retrieved from [https://www.cdc.gov/dhdsp/data\\_statistics/fact\\_sheets/fs\\_heart\\_failure.htm](https://www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_heart_failure.htm)
- Centers for Disease Control and Prevention. (2016a). *Health of Hispanics or Latino population*. Retrieved from <http://www.cdc.gov/nchs/fastats/hispanic-health.htm>
- Centers for Disease Control and Prevention. (2016b). *Heart failure fact sheet*. Retrieved from [http://www.cdc.gov/DHDSP/data\\_statistics/fact\\_sheets/fs\\_heart\\_failure.htm](http://www.cdc.gov/DHDSP/data_statistics/fact_sheets/fs_heart_failure.htm)
- Centers for Disease Control and Prevention. (2015). *Heart disease*. Retrieved from <http://www.cdc.gov/nchs/fastats/heart-disease.htm>
- Centers for Medicare & Medicaid Services. (2017). Readmission reduction program (HRRP). Retrieved from <https://www.cms.gov/medicare/medicare-fee-for-service-payment/acuteinpatientpps/readmissions-reduction-program.html>
- Centers for Medicare & Medicaid Services. (2016). *Home health compare datasets*. Retrieved from <https://data.medicare.gov/data/home-health-compare>

Centers for Medicare & Medicaid Services. (2016a). Linking quality to payment.

Retrieved from <https://www.medicare.gov/hospitalcompare/linking-quality-to-payment.html>

Centers for Medicare & Medicaid Services. (2016b). *Glossary*. Retrieved from Centers for Medicare & Medicaid Services:

<https://www.cms.gov/apps/glossary/default.asp?Letter=C&Language=English>

Centers for Medicare & Medicaid Services. (2016c). *Conditions for Coverage (CfCs) &*

*Conditions of Participations (CoPs)*. Retrieved from Centers for Medicare &

Medicaid Services: [https://www.cms.gov/Regulations-and-](https://www.cms.gov/Regulations-and-Guidance/Legislation/CFCsAndCoPs/index.html?redirect=/CFCsAndCops/16_A)

[Guidance/Legislation/CFCsAndCoPs/index.html?redirect=/CFCsAndCops/16\\_A](https://www.cms.gov/Regulations-and-Guidance/Legislation/CFCsAndCoPs/index.html?redirect=/CFCsAndCops/16_A)  
SC.asp

Centers for Medicare & Medicaid Services. (2011). Retrieved from Medicare-Medicaid

Enrollee Information Connecticut 2011: [https://www.cms.gov/Medicare-](https://www.cms.gov/Medicare-Medicaid-Coordination/Medicare-and-Medicaid-Coordination/Medicare-Medicaid-Coordination-Office/Downloads/2011StateProfilesCT.pdf)

[Medicaid-Coordination/Medicare-and-Medicaid-Coordination/Medicare-](https://www.cms.gov/Medicare-Medicaid-Coordination/Medicare-and-Medicaid-Coordination/Medicare-Medicaid-Coordination-Office/Downloads/2011StateProfilesCT.pdf)

[Medicaid-Coordination-Office/Downloads/2011StateProfilesCT.pdf](https://www.cms.gov/Medicare-Medicaid-Coordination/Medicare-and-Medicaid-Coordination/Medicare-Medicaid-Coordination-Office/Downloads/2011StateProfilesCT.pdf)

Chen, J., Dharmarajan, K., Wang, Y., & Krumholz, H. M. (2013). National trends in

heart failure hospital stay rates, 2001 to 2009. *Journal of the American College of*

*Cardiology*, 61(10), 1078-1088. doi:10.1016/j.jacc.2012.11.057

Chiang, L.-C., Chen, W.-C., Dai, Y.-T., & Ho, Y.-L. (2012). The effectiveness of

telehealth care on caregiver burden, mastery of stress, and family function among

family caregivers of heart failure patients: A quasi-experimental study.

*International Journal of Nursing Studies*, 49(10), 1230–1242.

doi:10.1016/j.ijnurstu.2012.04.013

Cohen, J. (1992). A power primer. *Psychological bulletin*, 112(1), 155-159.

doi:10.1037/0033-2909.112.1.155

Coleman, K., Austin, B. T., Brach, C., & Wagner, E. H. (2009). Evidence on the Chronic Care Model in the new millennium. *Health Affairs*, 28(1), 75–85.

doi:10.1377/hlthaff.28.1.75

Connecticut Department of Public Health (DPH). (2016a). *State public health actions (1305, SHAPE) grant*. Retrieved from Connecticut cardiovascular disease statistics:

[http://www.ct.gov/dph/lib/dph/hems/chronic\\_dis/heartdisease/ct\\_cvd\\_stats\\_17apr2015\\_final.pdf](http://www.ct.gov/dph/lib/dph/hems/chronic_dis/heartdisease/ct_cvd_stats_17apr2015_final.pdf)

Connecticut Department of Public Health (DPH). (2016b). *Community, family, and health equity section*. Retrieved from Racial and ethnic disparities in hospital charges in Connecticut: Data update: [www.ct.gov/dph/chronicdisease](http://www.ct.gov/dph/chronicdisease)

Connecticut Department of Public Health [DPH]. (2011). *The burden of cardiovascular disease in Connecticut: 2010 surveillance report*. Retrieved from Keeping Connecticut healthy:

[http://www.ct.gov/dph/lib/dph/hisr/pdf/2010cvd\\_burdendoc\\_final.pdf](http://www.ct.gov/dph/lib/dph/hisr/pdf/2010cvd_burdendoc_final.pdf)

Connecticut Voices for Children. (2015). Enrollment in Connecticut's HUSKY program continues to increase under the Affordable Care Act. pp. 1-4. Retrieved from

<http://www.ctvoices.org/sites/default/files/h15huskyenrollmentACAupdateMay2015.pdf>

- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3<sup>rd</sup> ed.). Los Angeles, CA: SAGE
- Czaja, S. J., Chin, C. L., Arana, N., Nair, S. N., & Sharit, J. (2016). Use of a telehealth system by older adults with hypertension. *JTelemed Telecare*, 20(4), 184-191.  
doi:10.1177/1357633X14533889
- Desai, A. S., & Stevenson, L. W. (2012). Rehospitalization for heart failure. Predict or prevent? *Circulation*, 126(4), 501-506.  
doi:10.1161/CIRCULATIONAHA.112.125435
- Edwards, L., Rooshenas, L., & Isaacs, T. (2016). Inclusion of ethnic minorities in telehealth trials for type 2 diabetes: Protocol for a systematic review examining prevalence and language issues. *JMIR Research Protocol*, 5(1), e43.  
doi:10.2196/resprot.5195
- Ferrante, D., Varini, S., Macchia, A., Soifer, S., Badra, R., Nul, D., . . . Doval, H. (2010). Long-term results after a telephone intervention in chronic heart failure: DIAL (randomized trial of phone intervention in chronic heart failure) follow-up. *Journal of the American College of Cardiology*, 56(5), 372-380.  
doi:10.1016/j.jacc.2010.03.04
- Field, A. (2013). *Discovering statistics using IBM SPSS statistics* (4th ed.). Los Angeles, CA: SAGE

- Fleming, L. A., & Kociol, R. D. (2014). Interventions for heart failure readmissions: Successes and failures. *Curr Heart Fail Rep, 11*(2), 178-187. doi:10.1007/s11897-014-0192-x
- Frankfort-Nachmias, C., & Nachmias, D. (2008). *Research methods in the social sciences* (7th ed.). New York, NY: Worth
- Gheorghiade, M., Vaduganathan, M., Fonarow, G. C., & Bonow, R. O. (2013). Rehospitalization for heart failure: Problems and perspectives. *Journal of the American College of Cardiology, 61*(4), 391-403. doi:10.1016/j.jacc.2012.09.038
- Graham, G. (2014). Population-based approaches to understanding disparities in cardiovascular disease risk in the United States. *International Journal of General Medicine, 4*(7), 393–400. doi: <https://doi.org/10.2147/IJGM.S65528>
- Green, S. B., & Salkind, N. J. (2014). *Using SPSS for windows and macintosh: Analyzing and understanding data* (7<sup>th</sup> ed.). Boston, MA: Pearson.
- Group Health Research Institute. (2017a). *Edward H. Wagner, MD, MPH*. Retrieved from Biography: <https://www.grouphealthresearch.org/our-research/our-scientists/wagner-edward-h/>
- Group Health Research Institute. (2017b). *The Chronic Care Model*. Retrieved from Improving chronic illness care: <http://www.improvingchroniccare.org>
- Grove, S. K., Burns, N., & Gray, J. (2013). *The practice of nursing research: Appraisal, synthesis, and generation of evidence* (7<sup>th</sup> ed.). St. Louis: Elsevier Saunders.
- Guzman-Clark, J. R., van Servellen, G., Chang, B., Menten, J., & Hahn, T. J. (2013). Predictors and outcomes of early adherence to the use of a home telehealth device

- by older veterans with heart failure. *TELEMEDICINE and e-HEALTH*, 19(3), 217-223. doi:10.1089/tmj.2012.0096
- Haggstrom, D. A., Taplin, S. H., Monahan, P., & Clauser, S. (2012). Chronic Care Model implementation for cancer screening and follow-up in community health centers. *Journal of Health Care for the Poor and Underserved*, 23(3), 49-66. doi:10.1353/hpu.2012.0131
- Hasan, A., & Paul, V. (2011). Telemonitoring in chronic heart failure. *European Heart Journal*, 32(12), 1457–1464. doi:10.1093/eurheartj/ehr005
- Hebert, K., Julian, E. B., Alvarez, J., Dias, A., Tamariz, L., Arcement, L., & Quevedo, H. (2011). Eliminating disparities in hypertension care for Hispanics and Blacks using a heart failure disease management program. *Southern Medical Journal*, 104(8), 567-573. doi:10.1097/SMJ.0b013e318224dd18
- Heidenreich, P. A., Trogon, J. G., Khavjou, O. A., Butler, J., Dracup, K., Ezekowitz, M. D., . . . Woo, J. (2011). Forecasting the future of cardiovascular disease in the United States: A policy statement from the American Heart Association. *Circulation*, 123(8), 933-944. doi:10.1161/CIR.0b013e31820a55f5
- Heron, M. (2016). Deaths: Leading causes for 2013. *National Vital Statistics Report (NVSS)*, 65(2), 1-95. Retrieved from <http://www.cdc.gov/nchs>
- Holm, A. L., & Severinsson, E. (2014). Perceptions of the need for improvements in healthcare after implementation of the Chronic Care Model. *Nursing & Health Sciences*, 16(4), 442–448. doi:10.1111/nhs.12136

- Huffman, M. D., Berry, J., Ning, H., Dyer, A. R., Garside, D. B., Cai, X., . . . Lloyd-Jones, D. M. (2013). Lifetime risk for heart failure among White and Black Americans: Cardiovascular lifetime risk pooling project. *Journal of the American College of Cardiology*, *61*(14), 1510-1517. doi:10.1016/j.jacc.2013.01.022
- Hughes, H. A., & Granger, B. B. (2011). Racial disparities and the use of technology for self-management in Blacks with heart failure: A literature review. *Current Heart Failure Reports*, *11*(3), 281–289. doi:10.1007/s11897-014-0213-9
- Joshi, P., Marino, M., Bhoi, A., & McCoy, N. (2011). Reducing the burden of cardiovascular disease: A qualitative assessment of Louisiana health disparities collaboratives. *Journal of Cardiovascular Disease Research*, *3*(4), 305-309. doi:10.4103/0975-3583.102711
- Kelesidis, I., Varughese, C. J., Hourani, P., & Zolty, R. (2013). Effects of  $\beta$ -adrenergic blockade on left ventricular remodeling among Hispanics and African Americans with chronic heart failure. *Clinical Cardiology*, *36*(10), 595–602. doi:10.1002/clc.22164
- Kuo, Y.-H., Chien, Y.-K., Wang, W.-R., Chen, C.-H., Chen, L.-S., & Ching-Kuan, L. (2011). Development of a home-based telehealthcare model for improving the effectiveness of the chronic care of stroke patients. *Kaohsiung Journal of Medical Sciences*, *28*(1), 38-43. doi:10.1016/j.kjms.2011.10.001
- Lambrinou, E., Kalogirou, F., Lamnisis, D., & Sourtzi, P. (2012). Effectiveness of heart failure management programmes with nurse-led discharge planning in reducing



- re-admissions: A systematic review and meta-analysis. *International Journal of Nursing Studies*, 49(5), 610–624. doi:10.1016/j.ijnurstu
- LaVeist, T. A., Gaskin, D., & Richard, P. (2011). Estimating the economic burden of racial health inequalities in the United States. *International Journal of Health Services*, 41(2), 231-238. doi:10.2190/HS.41.2.c
- Lu, M. L., Davila, C. D., Shah, M., Wheeler, D. S., Ziccardi, M. R., Banerji, S., & Figueredo, V. M. (2016). Marital status and living condition as predictors of mortality and readmissions among African Americans with heart failure. *International Journal of Cardiology*, 222(1), 313-318. doi:10.1016/j.ijcard.2016.07.185
- Mackey, K., Parchman, M. L., Leykum, L. K., Lanham, H. J., Noel, P. H., & Zeber, J. E. (2012). Impact of the Chronic Care Model on medication adherence when patients perceive cost as a barrier. *Primary Care Diabetes*, 6(2), 137-142. doi:10.1016/j.pcd.2011.12.004
- Mangla, A., Doukky, R., Powell, L. H., Avery, E., Richardson, D., & Calvin Jr., J. E. (2014). Congestive heart failure adherence redesign trial: a pilot study. *BMJ Open*, 4(12), 1-7. doi:10.1136/bmjopen-2014006542
- Maru, S., Byrnes, J., Carrington, M. J., Chan, Y.-K., Thompson, D. R., Stewart, S., & Scuffham, P. A. (2015). Cost-effectiveness of home versus clinic-based management of chronic heart failure: Extended follow-up of a pragmatic, multicentre randomized trial cohort — The WHICH? study. *International Journal of Cardiology*, 201, 368-375. doi:10.1016/j.ijcard.2015.08.066

- McClintock, S., & Smith, L. F. (2014). Strategies for reducing the hospital readmission rates of heart failure patients. *The Journal for Nurse Practitioners*, *10*(6), 430-433. doi:10.1016/j.nurpra.2014.04.005
- McLaughlin, D., Hoy, L., & Glacklin, M. (2015). Heart failure nurse specialist crisis interventions and avoided hospital admission. *British Journal of Cardiac Nursing*, *10*(7), 326-333. doi:10.12968/bjca.2015.10.7.326
- Melton, K. D., Foli, K. J., Yehle, K. S., & Griggs, R. R. (2015). Heart failure in Hispanic Americans: Improving cultural awareness. *The Journal for Nurse Practitioners*, *11*(2), 207-213. doi:http://dx.doi.org/10.1016/j.nurpra.2014.08.010
- Pallant, J. (2013). *SPSS survival manual: A step by step guide to data analysis using IBM SPSS* (5th ed.). New York, NY: McGraw Hill
- Parissis, J., Athanasakis, K., Farmakis, D., Boubouchairopoulou, N., Mareti, C., Bistola, V., . . . Lekakis, J. (2014). Determinants of the direct cost of heart failure hospitalization in a public tertiary hospital. *International Journal of Cardiology*, *180*(1), 46-49. doi:10.1016/j.ijcard.2014.11.123
- Priest, J. L., Cantrell, R., Fincham, J., L, C. C., & Burch, S. P. (2011). Quality of care associated with common chronic diseases in a 9-State Medicaid population utilizing claims data: An evaluation of medication and health care use and costs. *Population Health Management*, *14*(1), 43-54. doi:10.1089/pop.2010.0019
- Riles, E.M., Jain, A.V. & Fendrick, A.M. (2014). Medication and adherence in heart failure. *Current Cardiology Reports*, *16* (458), 1-6. doi:10.1007/s11886-013-0458-z

- Rodriguez, F., Joynt, K. E., López, L., Saldaña, F., & Jha, A. K. (2011). Readmission rates for Hispanic Medicare beneficiaries with heart failure and acute myocardial infarction. *American Heart Journal*, *162*(2), 254–261.  
doi:10.1016/j.ahj.2011.05.009
- Roebuck, M. C., Liberman, J. N., Gemmill-Toyama, M., & Brennan, T. A. (2011). Medication adherence leads to lower health care use and costs despite increased drug spending. *Health Affairs*, *30*(1), 91-99. doi:10.1377/hlthaff.2009.1087
- Ryan, J., Andrews, R., Barry, M. B., Kang, S., Iskander, A., Mehla, P., . . . Raj. (2013). Preventability of 30-day readmissions for heart failure patients before and after a quality improvement initiative. *American Journal of Medical Quality*, *29*(3), 1-7.  
doi:10.1177/1062860613496135
- Ryan, J., Kang, S., Dolacky, S., Ingrassia, J., & Ganeshan, R. (2013). Change in readmissions and follow-up visits as part of a heart failure readmission quality improvement initiative. *The American Journal of Medicine*, *126*(11), 989-994.  
doi:10.1016/j.amjmed.2013.06.027
- Santos, M. V., Oliveira, D. C., & Araujo, M. D. (2013). A telehealth strategy for increasing adherence in the treatment of hypertension in primary care. *Telemedicine and e-Health*, *19*(4), 241-247. doi:10.1089/tmj.2012.0036
- Sharma, S.K., (2015). *Nursing research & statistics* (2<sup>nd</sup> ed.) Haryana, India: Elsevier
- Sherer, A. P., Crane, P. B., Abel, W. M., & Efirid, J. (2016). Predicting heart failure readmissions. *Journal of Cardiovascular Nursing*, *31*(2), 114-120.  
doi:10.1097/JCN.0000000000000225

- Steele, L. L., & Steele, J. R. (2015). Heart failure outcomes based on race and gender of patients in a medically underserved area. *Journal of Immigrant and Minority Health, 17*(1), 139-147. doi:10.1007/s10903-013-9892-7
- Stewart, S., Carrington, M. J., Marwick, T. H., Davidson, P. M., Macdonald, P., Horowitz, J. D., . . . Scuffham, P. A. (2012). Impact of home versus clinic-based management of chronic heart failure. *Journal of the American College of Cardiology, 60*(14), 1239-1248. doi:10.1016/j.jacc.2012.06.025
- Stauffer, B. D., Fullerton, C., Fleming, N., Ogola, G., Herrin, J., Stafford, P. M., & Ballard, D. J. (2011). Effectiveness and cost of a transitional care program for heart failure: A prospective study with concurrent controls. *Arch Intern Med, 171*(14), 1238-1243. doi:10.1001/archinternmed
- Suter, P., Suter, N., & Johnston, D. (2011). Theory-based telehealth and patient empowerment. *Population Health Management, 14*(2), 87-92. doi:10.1089/pop.2010.0013
- The American Psychological Association [APA]. (2010). *Publication manual of the American Psychological Association* (6<sup>th</sup> ed.). Washington, DC.
- Thompson, K. L., Hernandez, A. F., Dai, D., Heidenreich, P., Fonarow, G. C., Peterson, E. D., & Yancy, C. W. (2011). Association of race/ethnicity with clinical risk factors quality of care, and acute outcomes in patients hospitalized with heart failure. *American Heart Journal, 161*(4), 746-754. doi:10.1016/j.ahj.2011.01.012
- Torpy, J. M., Lynm, C., & Golub, R. M. (2011). Heart failure. *JAMA, 306*(19), 2175. doi:10.1001/jama.306.19.2175

- Turner, A. P., Sloan, A. P., Kivlahan, D. R., & Kaselkorn, J. K. (2014). Telephone counseling and home telehealth monitoring to improve medication adherence: Results of a pilot trial among individuals with multiple sclerosis. *Rehabilitation Psychology, 59*(2), 136–146. doi:10.1037/a0036322
- U.S. Census Bureau. (2015). Hispanic Americans by the numbers. Retrieved from <http://www.infoplease.com/spot/hhmcensus1.html>
- Wakefield, B. J., Holman, J. E., Ray, A., Scherubel, M., Adams, M. R., Hillis, S. L., & Rosenthal, G. E. (2011). Effectiveness of home telehealth in comorbid diabetes and hypertension: A randomized, controlled trial. *Telemedicine and E-Health, 17*(4), 254-261. doi:10.1089/tmj.2010.0176
- Welch, T., Bilchick, K., Reigle, N., Kennedy, J., Lawlor, B., Bergin, . . . Mazimba, S. (2016). Cost analysis of heart failure readmission intervention program. *Journal of the American College of Cardiology, 67*(13), 1293. doi:10.1016/S0735-1097(16)31294-3
- Whittaker, B. D., Soine, L. A., & Errico, K. M. (2014). Patient and process factors associated with all-cause 30-day readmission among patients with heart failure. *Journal of the American Association of Nurse Practitioners, 27*(2015), 105-113. doi:10.1002/2327-6924.12123
- Wielawski, I. M. (2006). Improving Chronic Illness Care. In T. R. Foundation, *The Robert Wood Johnson Foundation Anthology* (Vol. X, pp. 1-17). Princeton, NJ: Robert Wood Johnson Foundation

- Willemse, E., Adriaenssens, J., Dilles, T., & Remmen, R. (2014). Do telemonitoring projects of heart failure fit the Chronic Care Model? *International Journal of Intergrated Care, 14*(1), 1-11. Retrieved from <http://www.ijic.org>
- Wu, J.-R., Frazer, S., Rayens, M. K., Lennie, T. A., Chung, M. L., & Moser, D. K. (2013). Medication adherence, social support, and event-free survival in patients with heart failure. *Health Psychology, 32*(6), 637-646. doi:10.1037/a0028527
- Yancy, C. W., Fonarow, C. G., Albert, N. M., Curtis, A. B., Stough, W. G., . . . Walsh, M. N. (2010). Adherence to Guideline-Recommended Adjunctive Heart Failure Therapies Among Outpatient Cardiology Practices (Findings from IMPROVE heart failure). *The American Journal of Cardiology, 105*(2), 255-260. doi:10.1016/j.amjcard.2009.08.681
- Zhang, Y., & Baik, S. H. (2014). Race/Ethnicity, disability, and medication adherence among Medicare beneficiaries with heart failure. *Journal of Internal General Medicine, 29*(4), 602-607. doi:10.1007/s11606-013-2692-x
- Zivin, K., Ratliff, S., Heisler, M. M., Langa, K. M., & Piette, J. D. (2010). Factors influencing cost-related nonadherence to medications in older adults: A conceptually based approach. *Value In Health, 13*(4), 338–345. doi:10.1111/j.1524-4733.2009.00679.x

## Appendix A: Assumption of Linearity

Testing for Linearity of the Logit							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 <sup>a</sup>	AGE	.498	.666	.559	1	.455	1.645
	AGE by LnAge	-.098	.126	.609	1	.435	.906
	Constant	-5.124	9.050	.321	1	.571	.006

a. Variable(s) entered on step 1: AGE, AGE \* LnAge .

## Appendix B: Test of Independence of Errors

Model Summary <sup>b</sup>					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.280 <sup>a</sup>	.078	.043	.488	2.010

a. Predictors: (Constant), Age, Race/Ethnicity, gender, Telemonitor, Insurance

b. Dependent Variable: Readmitted



## Appendix C: Classification Table

Observed		Predicted		
		Readmitted	Yes	Percentage
Step 1	Readmitted No	36	26	58.1
	Yes	18	58	76.3
Overall Percentage				68.1

a. The cut value is .500

## Appendix D: Categorical Variables Coding

Categorical Variables Codings			Parameter coding	
		Frequency	(1)	(2)
Race/Ethnicity	Hispanic	46	.000	.000
	White	46	1.000	.000
	Black	46	.000	1.000
Telemonitor	No	69	1.000	
	Yes	69	.000	
Insurance	Medicare			
	Source	111	.000	
	Medicaid	27	1.000	
gender	Female	98	.000	
	Male	40	1.000	