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Socioeconomic and health-related factors affecting Congestive Heart Failure Readmissions

Jollibyrd Miguel Gusto
Walden University

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Walden University

College of Health Sciences

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Jollibyrd Gusto

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Walden University
2020

Abstract

Socioeconomic and Health-Related Factors
Affecting Congestive Heart Failure Readmissions

by

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2001

Bachelor of Science in Nursing, Mariano Marcos State University, 1994

Doctoral Study Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Public Health

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Abstract

Congestive heart failure (CHF) readmissions are frequent and costly, but preventable. These readmissions not only contribute to rising healthcare cost but also affect the quality of life of these individuals and their loved ones. Guided by the social ecology model for health for health promotion, the purpose of this study was to analyze the socioeconomic and health-related factors of CHF readmissions. The main hypothesis of this study was that there was a relationship between 30-day readmissions of individuals with CHF and their payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities in the dataset as identified in their medical record after adjusting for potential confounders. This retrospective case-control study used secondary data from patients with CHF admitted to a northern Virginia hospital from July 2014 to December 2017. Data were analyzed using chi-square and logistic regression. Results of the study showed that living arrangements and chronic renal failure (CRF) were significant predictors of CHF readmissions. Patients who lived with family and those from assisted living facilities were less likely to be readmitted than those who lived alone (OR: 0.2 and 0.5, respectively). In addition, patients without CRF were also less likely to be readmitted than those who have CRF (OR: 0.6). This study can contribute to positive social change through research-based data necessary to create strong and meaningful community-based public health programs specifically tailored towards individuals who are frequently readmitted due to CHF exacerbation, taking into consideration the group's specific circumstances and special needs.

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Dedication

This study is dedicated to the great warrior—Mr. Ildefonso Soliven Gusto—and to the memory of Mrs. Peregrina Miguel Gusto: *Dios ti ag-ngina iti amin amin!*

As well as:

To all Healthcare workers in the acute care, community, skilled nursing, assisted living facilities and public health—you are all parts of the puzzle. Everyone is equally important!

To all Healthcare administrators, managers and supervisors—you are being looked upon and respected! Thank you for being good leaders!

To all Healthcare educators, teachers, professors—your guiding hands have trained and will still train future healthcare workers. Thank you for guiding the students develop their own independent wings!

And:

To all CHF patients and their loved ones. We know your struggles. Rest assured that we are all here to help you!

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Section 1: Foundation of the Study and Literature Review

Introduction

Congestive heart failure (CHF) is a chronic and progressive disease of the heart characterized by weakening of the heart muscles resulting to inability to pump sufficient amount of blood to meet the metabolic needs of the body (American Heart Association [AHA], 2016). The most common risk factors include coronary heart disease, high blood pressure, and diabetes, while the following unhealthy behaviors can significantly increase one's risk for heart failure, especially for individuals with one or more of the risk factors: smoking, consuming fatty and salty foods, having a sedentary lifestyle, and being obese (Centers for Disease Control and Prevention [CDC], 2016).

The common signs and symptoms of CHF are shortness of breath during activities of daily living (walking, eating, showering, etc.), difficulty breathing while lying down (orthopnea), unintentional weight gain with swelling of feet and legs, and generalized feeling of weakness or being tired (CDC, 2016). Home treatments usually include diet, compliance to discharged medications, and timely appointments with healthcare providers. If individuals with CHF comply with these home treatments, they can usually live a normal life with some adjustments (AHA, 2016).

Hospital readmission due to CHF exacerbation remains a health issue. Heart failure is the leading cause of hospital readmissions in the United States (Feltner et al., 2014; Kheirbek et al., 2015). According to Regenstein and Andres (2014), about one in five patients with CHF who were admitted to hospitals would be readmitted within the next 6 months with readmission rates that differ by the person's payer status and

demographics. Moreover, one in nine deaths in 2009 included heart failure as a contributing factor (Centers for Disease Control and Prevention, 2016).

I developed this study in response to the existing and continually growing problem of CHF readmissions. These readmissions not only contribute to the rising the cost of healthcare in general but more importantly, CHF readmissions negatively impact the quality of life of the affected individuals (Rizzuto et al., 2017). By understanding the possible factors that may be affecting hospital readmission, community-based programs can be created and tailored regarding these specific factors. In the end, this study will contribute to positive social change to the affected group in particular and to the population in general. This positive social change will be measured in short term through lower CHF readmissions and the long term through improved health outcomes as measured by better quality of life among individuals with CHF.

This section contains the problem statement, purpose of the study, research questions and hypotheses, theoretical foundation for the study, and nature of the study. It also contains literature search and strategy, review of literature, definition of terms, assumptions, scope and delimitation, and significance, summary and conclusion. Lastly, the literature review includes prevalence and cost of CHF readmission; racial and economic factors of CHF readmissions; patient support system as social factor, cognitive, behavioral or psychiatric factors, comorbidities, hospital-based management of CHF readmissions, community-based interventions related to CHF readmissions, and community-level CHF self-management.

Problem Statement

CHF hospital readmissions are frequent and costly yet highly preventable. Many readmissions are considered avoidable and often considered a mark of poor quality of care (Regenstein & Andres, 2014). In a landmark article in 2009, Jencks et al. (2009) found that 19.6 % of Medicare patients were readmitted to hospitals within 30 days of discharge, the highest of which were patients with CHF (26.9%), as compared to chronic obstructive pulmonary disease (COPD; 25.8%) and pneumonia (20.1%). Moreover, CHF readmission rates have been documented in other populations as well. Coffey et al. (2012) found that Medicaid 30-day CHF readmission was 52% higher than Medicare and 87% higher than for individuals with private insurance.

While CHF readmission can be a hospital issue because of the penalty imposed by the Centers for Medicare and Medicaid to hospitals if the latter fail to meet an established benchmark, frequent readmissions also need to be considered as a public health issue (Lavenberg et al., 2014; Lee et al., 2016; Kripalani et al., 2014). This is because individuals with CHF live in their respective communities and their illness exacerbation develops while they are in the community (Chamberlain et al., 2015). Unfortunately, there are limited community-based studies that are focused on socioeconomic and health-related factors that may affect readmission. Moreover, most strategies to control CHF readmissions are hospital-initiated. For example, a systematic review of 43 interventions that were published from 1975 to 2011 to reduce 30-day hospital readmissions was conducted by Hansen et al. (2011) and were found to be all hospital-initiated. Thus, there is a need to study the socioeconomic and health-related factors that might be causing

these individuals to be frequently readmitted. In other words, a better and clearer understanding of these factors is essential for more effective targeting of CHF management, health promotion and illness prevention.

Purpose of the Study

The purpose of this quantitative retrospective case-control study was to analyze the socioeconomic and health-related factors that may be affecting hospital CHF readmission. I analyzed these socioeconomic and health-related factors within the context of community/public health because these affected individuals live in the community with these factors, which cannot be separated, compartmentalized, and individually analyzed. These factors must therefore be addressed not in the hospital or acute care settings perspective since they are more focused on the acute phase of the illness, but rather under the public health lens. These factors are community health-related variables that need to be studied within the public health perspective. These include the presence of other comorbidities (Chamberlain et al., 2017; Triposkiadis & Skoularigis, 2012), patient ethnicity/race, language, payer status (Regenstein & Andres, 2014) and living arrangements as an indicator of social support (Rubin et al., 2014). I also looked into covariates like the patient's age and sex as potential confounders.

Research Questions and Hypotheses

Research Question 1 (RQ1): What is the relationship between 30-day readmission of individuals with CHF and their payer status as measured by type of insurance or its absence?

Null Hypothesis (H_01): There is no relationship between 30-day readmission of individuals with CHF and their payer status as measured by type of insurance or its absence after adjusting for potential confounders.

Alternative Hypothesis (H_{a1}): There is a relationship between 30-day readmission of individuals with CHF and their payer status as measured by type of insurance or its absence after adjusting for potential confounders.

Research Question 2 (RQ2): What is the relationship between 30-day readmission of individuals with CHF and their race?

Null Hypothesis (H_02): There is no relationship between 30-day readmission of individuals with CHF and their race after adjusting for potential confounders.

Alternative Hypothesis (H_{a2}): There is a relationship between 30-day readmission of individuals with CHF and their race after adjusting for potential confounders.

Research Question 3 (RQ3): What is the relationship between 30-day readmission of individuals with CHF and their ethnicity?

Null Hypothesis (H_03): There is no relationship between 30-day readmission of individuals with CHF and their ethnicity after adjusting for potential confounders.

Alternative Hypothesis (H_{a3}): There is a relationship between 30-day readmission of individuals with CHF and their ethnicity after adjusting for potential confounders.

Research Question 4 (RQ4): What is the relationship between 30-day readmission of individuals with CHF and their primary spoken language?

Null Hypothesis (H_04): There is no relationship between 30-day readmission of individuals with CHF and their primary spoken language after adjusting potential confounders.

Alternative Hypothesis (H_a4): There is a relationship between 30-day readmission of individuals with CHF and their primary spoken language after adjusting potential confounders.

Research Question 5 (RQ5): What is the relationship between 30-day readmission of individuals with CHF and their living arrangement?

Null Hypothesis (H_05): There is no relationship between 30-day readmission of individuals with CHF and their living arrangement after adjusting for potential confounders.

Alternative Hypothesis (H_a5): There is a relationship between 30-day readmission of individuals with CHF and their living arrangement after adjusting for potential confounders.

Research Question 6 (RQ6): What is the relationship between 30-day readmission of individuals with CHF and comorbidities in the dataset as identified in their medical record?

Null Hypothesis (H_06): There is no relationship between 30-day readmission of individuals with CHF and comorbidities in the dataset as identified in their medical record after adjusting for potential confounders.

Alternative Hypothesis (*Ha6*): There is a relationship between 30-day readmission of individuals with CHF and comorbidities in the dataset as identified in their medical record after adjusting for potential confounders.

Research Question 7 (RQ7): What is the relationship between 30-day readmission of individuals with CHF and their payer status, race, ethnicity, primary spoken language, living arrangement, and comorbidities in the dataset as identified in their medical record?

Null Hypothesis (*Ho7*): There is no relationship between 30-day readmission of individuals with CHF and their payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities in the dataset as identified in their medical record after adjusting for potential confounders.

Alternative Hypothesis (*Ha7*): There is a relationship between 30-day readmission of individuals with CHF and their payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities in the dataset as identified in their medical record after adjusting for potential confounders.

Theoretical Foundation for the Study

This study was based on the ecological models of health behavior (Glanz et al., 2008). In particular, it was guided by the social ecology model for health promotion by Daniel Stokols (1992, 1996). This model, like the general ecological models, is focused on understanding the transactions of an individual with his or her physical and sociocultural environments (Stokols, 1992). The environmental component distinguishes the models from behavioral theories that are focused on individual characteristics and proximal social influences like family or significant others but do not purposely consider

the broader influences of community, organization, and policy influences on health behaviors (Glanz et al., 2008). Various studies on health promotion have been focused towards behavioral change rather than environmentally based concepts. A majority of health promotion activities implemented in the acute care as well as community setting have been focused on the individual patient rather than the group or community as a whole (Glanz et al., 2008). Health-related programs have been designed, too, in order to alter the person's health habits and lifestyle like low salt diet, aerobic exercise, etc., with less emphasis on the provision of environmental resources and interventions that promote the wellbeing of the community residents in general and the concerned individual in particular (Glanz et al., 2008; Stokols, 1992). In response to this gap, I developed this study to assess the concept that there are various personal as well as community-related health factors that affect the hospital readmission of individuals with CHF after they are being discharged to the community.

This social ecology model takes into consideration the environmental and policy context of behavior as it incorporates social and psychological influences on it. It provides a more comprehensive framework in understanding the various and interacting factors that affect health behavior. In this doctoral study, health behaviors were related to treatment compliance that prevents CHF exacerbation and consequently prevents hospital readmission. As discussed in the literature review below, the problem of hospital readmission is affected by many factors that range from personal attributes to community-level resources as well as healthcare policies. In this study, I used the social

ecology model for health promotion to focus on factors affecting readmissions of individuals with CHF.

The Core Assumptions

There are four assumptions of the social ecology model of health promotion according to Daniel Stokols (1992). First, the level or degree of health of a situation and the participants are assumed to be influenced by multiple facets of both physical and social environment as well as personal attributes like psychological and behavioral patterns. Thus, the health and wellbeing of an individual is the result of the interplay among environmental and personal factors rather than from individual analysis of each factor (Glanz et al., 2008; Stokols, 1992, 1996). Regarding the personal attributes, in this study, I analyzed race, ethnicity, and the person's comorbidities as factors that affect readmissions.

Second, the multidimensional and complex nature of the environment should be considered in analyzing health and health promotion endeavors (Glanz et al., 2008; Stokols, 1992, 1996). Not only can environment be described in its physical and social attributes, it can also be characterized in terms of its objective (actual) and subjective (perceived) qualities. The person's home environment is an example of a factor that can possibly affect readmission. It is in this context that I studied the variable *living arrangement*—that is, whether the person with CHF lives alone, lives with family, lives in an assisted living facility or in a nursing home. It is also within the context of the social attribute of the environment that I included in my study the support system that the person has. Enguidanos et al. (2015) conducted a qualitative study on veterans'

perspectives on reason of readmission and the presence of caregiver support emerged as one of the essential themes in preventing unnecessary readmissions.

Third, like the environment that can be seen from its relative scale and complexity, the participants can be studied at different levels that range from individual level to family, group, and community levels (Stokols, 1992). This means that readmission of an individual with CHF can be analyzed from those points of view and their readmission can be affected by individual-, family-, group-, and/or community-level factors. Moreover, this model assumes that the effectiveness of a health-promotion endeavor can be facilitated significantly through the coordination of individuals and groups like family members, healthcare workers, healthcare managers, and policymakers who create community health-related laws and regulations (Stokols, 1992). These endeavors include but are not limited to family members who make efforts to assist an individual to comply with their discharged treatment plan, healthcare workers who manage specialized clinics like heart failure clinics or community health workers, and lawmakers or elected officials who enact laws and ordinances that affect the utilization of community and/or governmental resources. In this study, I considered the kind of living arrangement that the person has or was in and the efforts taken by family members to assist the person.

Lastly, the transaction between the person and the setting is characterized by cycles of mutual influence (Stokols, 1992, 1996). This means that the environment can directly influence the occupants' health and the occupants can modify the wellbeing of their surroundings through individual and collective action. Accordingly, efforts to

promote health and wellbeing must also consider the interdependencies that exist among immediate and distant environment (Glanz et al., 2008; Stokols, 1992, 1996). For example, community health programs and resources can affect how the person can prevent his or her illness exacerbation. Through these resources, the person may be able to improve their level of compliance to the treatment regimen. For example, the presence of community-based heart failure clinics and home-visiting programs can significantly lower all-cause readmission and mortality from heart failure (Feltner et al., 2014). These resources in turn can be directly influenced by state or federal laws and funding (distant environment). Health-related laws and their by-products like insurance can affect readmission itself.

There are various environmental and personal factors that can affect an individual's level of functioning. This model emphasizes the integration and analysis of these factors to create more effective policies, programs, and community-based public health interventions for healthier individuals, families, groups, and communities. I analyzed personal attributes like race, ethnicity, and the person's comorbidities, environmental factors like living arrangements and socioeconomic factors like the payer status of the person as independent variables to hospital readmissions. In response to the assertion of this theory that the degree of health of an individual measured here by hospital readmissions is affected by physical and social environment as well as personal attributes, I tested these variables singly and in combination to determine which among these have the greatest impact on hospital readmissions.

Nature of the Study

This was a retrospective case-control quantitative study. I observed, described, and documented the association between and among hospital readmissions due to CHF as the dependent variable and patient's payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities as independent variables. The *cases* were individuals who were readmitted within 30-days after their previous admission and the *controls* were individuals with CHF who were admitted but never experienced readmission within 30-days from their previous admission. I obtained the data related to these cases and controls from hospital records of admitted and readmitted individuals due to CHF who came from homes, shelters, assisted living facilities, and/or skilled nursing facilities. The secondary data that reflected the above variables of the target population of this study were from individuals in Loudoun County (and to an extent the surrounding counties) who were hospitalized from July 2014 to December 2017. To prevent potential ethical and legal issues, the research board of the university (# 05-31-19-0409674) as well as the Institutional Review Board (IRB) of the hospital (# 00001101) reviewed and approved my study proposal. I also secured all necessary documents before I conducted the study.

Literature Search Strategy

I conducted a review of literature using the following search terms: *CHF readmissions, CHF discharge treatment and compliance, CHF readmission and community health resources, public health and chronic diseases, public health and CHF home treatment compliance, CHF and public health, Daniel Stokols, ecological models of*

behavior, and social ecology model from the Ovid Medline and CINAHL databases for the years 2010–2019 for peer-reviewed articles as well as other articles from professional and scientific journals. The exception was when I searched seminal articles related to the theory wherein no specific years of publication were included. In addition, I also visited the websites of the CDC, Agency for Healthcare Research and Quality (AHRQ), AHA, Alzheimer’s Association, Mayo Clinic, and the National Institutes of Health (NIH) to obtain statistical figures and definitions of terms related to the study. Lastly, I also reviewed the references of articles on hand provided these articles were originally published from 2009—2019.

Review of Literature

Hospital readmission rates have become the benchmark of quality of care provided by the American healthcare system (Huesch et al., 2013; Lavenberg et al., 2014). Readmission rates can also be an indicator of quality of life of the older population (Hummel et al., 2014; Hutchinson et al., 2013). Thus, controlling hospital readmission is not just a clinical or hospital priority, it is also a health policy, and a political and economic issue (Gilstrap & Joynt, 2014). In addition, the issue of hospital readmission should not only focus on the hospital side. Rather, it should be seen through the public health lens too. Rather than totally reflective of the quality of care provided by hospitals, readmissions also reflect community, governmental, and patient factors (Gilstrap & Joynt, 2014; Soundarraaj et al., 2017). The public health system is an equally important component of the American healthcare delivery system in preventing unnecessary readmissions. While hospital is focused on the curative side of health and illness, public

health is geared towards illness prevention and health promotion. While the hospital or acute care is concerned on stabilizing an acutely ill individual, public health is focused on maintaining the individual's maximum level of functioning as they conduct their activities of daily living in the community (Schneider, 2011).

Unfortunately, the lack of progress in curbing CHF readmissions on the population-level basis necessitates all stakeholders to step back and reexamine the evidence on the factors that affect readmissions. In order to fully comprehend the factors that affect CHF readmission, this literature review includes the prevalence and cost of CHF readmissions, disparities in readmission, socio-behavioral factors, comorbidities, quality of care and management of CHF, community-based interventions, and community-level CHF self-management.

The Prevalence and Cost of CHF Readmissions

CHF is one of the most common and one of the most expensive chronic disease conditions among the American population (Manemann et al., 2016; Torio & Andrews, 2013; Mazimba et al., 2013). In the United States, about 5.1 million individuals had CHF with an estimated cost of approximately \$30.7 billion in 2012 and it is predicted that cases will increase to more than eight million individuals by 2030 (Jackevicius et al., 2015). Lifetime prevalence of CHF is about 20—33%, and about 20—25% of individuals admitted due to decompensated HF are being readmitted within 30 days (Feltner et al., 2014; Gilstrap, & Joynt, 2014). Within 3 months of CHF hospitalization, nationally, about 30% of these individuals are readmitted with a 10% mortality rate (Hernandez et al., 2013). Medicare claims data from a 2007—2009 analysis showed that 35% of

readmissions within 30 days were from CHF and the remainders were from other diseases like renal disorders, pneumonia, and arrhythmia (Feltner et al., 2014).

CHF is also considered the leading cause of hospitalization and healthcare cost in the United States (Cox et al., 2017; Feltner et al., 2014). The annual medical care cost of CHF currently is at \$20.9 billion and is projected to increase to \$53.1 billion in 2030, which is due to the projected increase in prevalence of CHF from current 2.4% to an estimated 3% by 2030 (Soundarraj et al., 2017). Moreover, 30-day readmissions from this disease cost Medicare over \$17 billion dollars yearly (Arundel et al., 2016; Cox et al., 2017; Lavenberg et al., 2014). Other authors place the price as high as \$30 billion in 2012 and the cost is projected to reach \$70 billion by 2030 (O'Connor et al., 2016), while another study mentioned that the average cost is estimated to be more than \$32 billion annually (Gilstrap & Joynt, 2014).

The public health implication of CHF and readmission is related to the burden on health care cost and its widespread prevalence affecting the quality of life of the individuals involved while they live in their respective communities. The economic impact of CHF is enormous with a significant portion of the expenditure attributed to frequent readmissions (Mazimba et al., 2013). Unfortunately, the direct cost mentioned above does not even include loss of productivity from CHF morbidity and mortality. Moreover, and more importantly, its effect on quality of life is even more significant. Increased readmissions can lead to greater strain on the patient and his/her family (Enguidanos et al., 2015). Resources that could have been utilized for other purposes to enhance their personal lives would be used instead for this problem. Furthermore, illness

exacerbation can prevent the individual from conducting activities of daily living (ADLs) and readmissions can disrupt their day-to-day lives in the community (Chamberlain et al., 2015; Enguidanos et al., 2015). As mentioned, the most common symptom of this illness is shortness of breath while conducting daily activities. This would make the person unable to function normally during illness exacerbation and may eventually require assistance from others in his/her ADLs.

Racial and Economic Factors of CHF Readmissions

Low-income and minority individuals are affected the most with CHF readmissions because they are more likely to have multiple chronic conditions and suffer worse outcomes than their more advantaged counterparts (Shaw, et al., 2016). Moreover, language spoken or the ability to speak the English language is very important. Unfortunately, the ability to speak English in the United States may affect the person's ability to make money. In other words, a person's difficulty in spoken English can negatively affect their ability to get a job, get a full-time job, and earn competitive salaries (Olney, 2017). This in turn, can affect the socioeconomic status of the person, which is measured, among other things, by income and wealth (Virginia Department of Health, 2014).

Medicaid beneficiaries, who usually belong to the lower income group, are consistently in poorer health than their privately insured counterparts and have a number of socioeconomic disadvantages that impede effective self-management of chronic illness, like treatment compliance on diet, medications, and timely follow-up with healthcare practitioners (Regenstein & Andres, 2014). These socioeconomic

disadvantages include limited access to specialty care, issues with insurance coverage, difficulties obtaining prescribed medications, issues with transportation, and lower health literacy (Cheung et al., 2012). One limitation of Regenstein and Andres' (2014) study, however, is that it was focused only on Medicaid recipients. These recipients are just part of the population group that experiences readmissions, showing a need for more comprehensive studies. This doctoral study includes all eligible populations from Medicare, Medicaid, private insurance, combination, and self-pay. Similarly, a study was conducted in Canada on the financial barriers and clinical outcomes of patients with cardiovascular-related chronic diseases. Campbell et al. (2017), in a cohort study of individuals above 45 years of age, found that one in 10 of their participants experienced financial barriers, the most common of which was related to accessing medication and healthful food. This, in turn, increased the rate of disease-related hospitalization and mortality compared to those without financial barriers (Campbell et al., 2017). This study identified 120,752 cohorts from the Canadian Community Health Survey that was administered between 2000 and 2011. The big number and the extensive 11-year survey compilation made the conclusion of this study very strong. Nevertheless, since this study was conducted from the Canadian population, the result may not necessarily reflect populations in other countries, pointing to the need for more U.S.-based studies.

In a study conducted on chronic disease disparities including CHF by county economic status, Shaw et al. (2016) concluded that residents from poor counties had higher prevalence of poor health outcomes than affluent counties. The same study noted that the prevalence of poor health outcomes decreased as the economic condition of the

county improved. Health outcomes like mortality and morbidity from chronic diseases in general have a direct positive relationship with the county's socioeconomic status; that is, as the economic status of the county goes up, the health outcomes in terms of controlling mortality and morbidity improve. In addition, a study on socioeconomic status and readmissions by Hu et al. (2014) found that patients living in neighborhoods with high poverty, low education, and low household incomes had greater risk of being readmitted from chronic illness exacerbation including CHF (Hu et al., 2014). In the study of Hu et al. (2014), the socioeconomic variables were measured at the community rather than individual level. The community-level variables include the availability of transportation, grocery stores, pharmacies, and health-related community resources (Hu et al., 2014). Similarly, affluent communities with ample social services as well as communities with strong public, private, or faith-based support networks have lower rates of readmissions as compared to poorer communities (Gilstrap & Joynt, 2014). These studies further show the necessity of looking into the issue of readmission as more than a biomedical issue. The presence or lack of these socio-cultural and economic-related community resources can significantly affect preventable hospital readmissions. As suggested by Shaw et al. (2016), poor counties can benefit from targeted community health interventions as well as better access to community healthcare services.

The existence of racial disparities in chronic diseases has long been recognized. For example, a study among individuals with diabetes mellitus (DM) in California on healthcare use, delayed care, and management of DM showed that Blacks were significantly less likely than Whites to see doctors and were more likely to visit the

emergency department (ED) for DM (Kim et al., 2012). Prior studies utilizing Medicare data indicated that Black patients have higher hospital readmission rates than White patients (Regenstein & Andres, 2014). Interestingly, however, these data were focused more on mortality and readmission and did not consider the individual's overall health status, like physical and social limitations as well as quality of life, which are the primary concerns of most individuals (Qian et al., 2015). Qian et al. (2015) studied racial differences on CHF outcomes, and they concluded that Black patients when compared to White patients had better patient-reported health status shortly after CHF admission but not after three or 6 months wherein there were no racial differences. This means that this study failed to show that Black patients were disadvantaged in comparison to White patients regarding health status after CHF hospitalization. On other hand, Saito et al. (2016) conducted a meta-analysis on risks for short-term readmission in patients with CHF and found a different trajectory—that Black race was not a significant factor associated with short-term readmission (Saito et al., 2016). Similarly, Kheirbek et al. (2015) studied all-cause readmission rate for older U.S. veterans hospitalized with heart failure. In summary, the authors found out that White and Black veterans hospitalized with heart failure had similar 30-day all-cause readmission and that White patients had higher all-cause mortality rate than Black patients (Kheirbek et al., 2015). Thus, with the other factors that may affect readmissions, it is imperative for the stakeholders to consider the interplay of these factors and understand that race alone may not be sufficient as a stand-alone factor in CHF readmission.

Social Factors: Patient Support System

Social factors are also contributory to readmissions. Rubin et al. (2014) conducted a study on the factors that affect readmissions among individuals with DM. According to this qualitative study, one theme that emerged included social support (Rubin et al., 2014). Similarly, Regenstein and Andres (2014) studied the contributing factors of early readmissions among Medicaid patients and found that problems with family/social support and housing instability are significant contributory factors to readmissions. These two studies showed that adequate patient support system is a significant factor in preventing CHF readmissions. The study done by Rubin et al. (2014), however, was conducted only from a single hospital that catered mainly to high-minority and low-income population and their focus was on DM readmission. While DM and CHF are both chronic diseases and the population may share similar characteristics, there may be factors unique to the CHF population that should be explored.

Similarly, in a study in Brazil on the relationship between social support and treatment adherence among individuals with DM, Boas et al. (2012) found out that the presence of a support system, like the availability of significant others, is necessary to adhere to the treatment regimen. In addition, patients who are divorced, disabled, who live alone, or have no usual source of care have all higher risk of 30-day readmission (Gilstrap & Joynt, 2014). Moreover, Enguidanos et al. (2015) explored the perspectives among seriously ill veterans with heart failure who were readmitted to the hospital within 30 days after discharge. Qualitative analysis of transcripts revealed that one theme relating to reasons of readmission is lack of caregiver support (Enguidanos et al., 2015).

A notable strength of the qualitative study conducted by Enguidanos et al. (2015) is that the participants were ethnically diverse. There were three Whites, three Hispanics, and three Blacks. Nevertheless, all of participants were men; thus, the study results were not representative of the entire population.

Notably, CHF readmission is often related to noncompliance with dietary restrictions, particularly sodium as well as medication (Sharma et al., 2014). The presence of family members either to remind or assist the person in making decisions regarding treatment regimen can increase the level of compliance, thus preventing possible illness exacerbation. Rubin et al. (2014) studied the contributing factors on early readmissions among individuals with DM and one theme that emerged from this qualitative study was that over half of their participants needed help in taking medications and preparing foods after discharge and that “not having someone to help out” negatively affected the participant’s ability to follow the discharge plan (Rubin et al., 2014, p. 872). While this study was conducted among individuals with DM, the issue is similar in CHF patients after discharge; that is, many of them may need help to comply with the discharge treatment plan. Enguidanos et al. (2015) found in their study on veterans’ perspective on readmission that lack of caregiver support or poor support at home has resulted noncompliance to treatment, faster decline in health and subsequent readmission.

In summary, factors like social support are very important components in preventing hospital readmissions. Social support can come from the people around the person. As a human being, the ailing person interacts with his or her environment, the

caregivers, the family, the group where he or she belongs and with the community as a whole. In essence, it is the opinions, suggestions, and encouragement of the people around the ailing person that can enhance or facilitate their decision to comply with discharged treatment regimen. Therefore, understanding the living arrangements of persons with CHF may offer insight into CHF readmissions.

Cognitive, Behavioral and Psychiatric Comorbidities

Cognitive and behavioral or psychiatric conditions are also factors to consider in readmissions (Gilstrap & Joynt, 2014; Ketterer et al., 2014). Ahmedani et al. (2015) completed a longitudinal study from 2009—2011 within 11 mental health research networks and concluded that psychiatric comorbidities can influence 30-day all cause readmission rates of individuals with CHF in which the readmission rate went up to 3—5% for those with psychiatric history as compared to those who did not have any (Ahmedani et al., 2015). One weakness of this study is that it was focused largely on participants from health systems that were well resourced and with affiliated health plans. These factors could have provided a more coordinated care. Thus, it may not represent poor and under-served populations. Examples of mental health conditions that are found among CHF patients include depression (Ahmedani et al., 2015; Gilstrap & Joynt, 2014; Ketterer et al., 2014; Triposkiadis & Skoularigis, 2012) as well as dementia and cognitive impairments (Agarwal et al., 2016; Ahmedani et al., 2015; Ketterer et al., 2014).

Interestingly, depression is one the behavioral or psychiatric conditions that is a common comorbidity among frequently readmitted individuals (Ahmedani et al., 2015; Gilstrap & Joynt, 2014). This is because depressed patients with CHF or other

cardiovascular diseases develop more symptoms, have worse medication compliance, and are slower to return to social activities, and depression is associated with a threefold increase in hospitalization (Triposkiadis & Skoularigis, 2012). Depression has also shown borderline but positive correlation with CHF readmission (Ketterer et al., 2014). Gilstrap and Joynt (2014), however, found that depression is a strong driver of readmission in their study on the relationship between readmission and quality of hospital care in CHF. The authors found that depression increased 90-day readmission rates from 37% for no depression to 43% for individuals with mild depression and up to 52% for those with major depression (Gilstrap & Joynt, 2014).

Dementia and cognitive impairment are also factors to consider in CHF readmission (Ahmedani et al., 2015; Triposkiadis & Skoularigis, 2012). Ketterer et al. (2014) conducted a study on behavioral factors and hospital admissions and readmissions in patients with CHF, which showed that cognitive impairments are possible determinants of early readmissions. Furthermore, Agarwal et al. (2016) concluded from their study on cognitive impairment and readmissions among elderly that cognitive impairment, which may be undocumented, may indicate higher risk of readmissions among CHF individuals than those without. This necessitates screening for cognitive impairment as well as involving family and other caregivers to help reduce readmission. This is because individuals with cognitive impairments are unable to follow through discharge instructions especially on diet and medication compliance in addition to follow-up appointments (Ketterer et al., 2014).

In summary, cognitive, behavioral, and psychiatric conditions can increase the risk of CHF exacerbation that can ultimately result in readmission. While these do not directly cause illness exacerbation, failure to comply with discharge treatment regimen, which is fairly common among individuals with cognitive impairment, can ultimately result in exacerbation.

Medical Comorbidities

It has been shown that 86 % to 98 % of heart failure patients have two or more additional chronic conditions on top of their heart failure (Chamberlain et al., 2015; Riegel et al., 2016). These concurrent conditions, or comorbidities, can affect progression, deterioration, and response to CHF treatment, thus affecting readmissions (Triposkiadis & Skoularigis, 2012). Lague et al. (2013) studied clinical identification of patients readmitted to hospitals and they concluded that many patients who were subsequently readmitted were best identified as medicine patients with multiple diagnoses, rather than a single one. This pointed out the need to manage a wide range of conditions for hospital readmissions rather than a narrow approach on individual diagnosis, as other comorbidities may affect readmission.

In order to evaluate the effect of comorbidities on CHF readmissions, it is important to understand which comorbidities are of importance to CHF readmission. Chamberlain et al. (2015) studied multimorbidity of CHF from a community perspective. Their participants were 1,382 patients from Olmsted County in Minnesota between 2000 and 2010. Results of their study showed that the most common chronic conditions were hypertension (HTN) and arrhythmias, which were present in more than 50% of the heart

failure patients. However, patients with myocardial infarction (MI), chronic pulmonary diseases, cancer, and dementia had an increased risk of being hospitalized within 30 days (Chamberlain et al., 2015). This study was focused on the chronic conditions identified by the US Department of Health and Human Services (DHHS). As mentioned by the authors, since they only focused on the conditions identified by the DHHS, other comorbidities other than those identified may contribute to readmissions (Chamberlain et al., 2015).

On other hand, in a study conducted in Greece on the prevalence and importance of comorbidities among patients with heart failure, the following were the common comorbidities: COPD (chronic obstructive pulmonary disease), obstructive sleep apnea (OSA), renal dysfunction, liver dysfunction, thyroid disorder, DM, depression, and cognitive impairment (Triposkiadis & Skoularigis, 2012). Moreover, Eastwood et al. (2014) found that renal dysfunction was an important comorbidity of CHF. The authors studied the characteristics of patients readmitted within 7 and 30 days after hospitalization for CHF in Alberta, Canada. Of the 18,590 patients, 5.6% were readmitted within 7 days and 18% were readmitted within 30 days. Readmission rates within 7 and 30 days significantly increased with increasing age whereas history of kidney disease was associated with the 7 days readmission (Eastwood et al., 2014). In summary, these comorbid conditions can be grouped according to the human anatomical and physiological system as follows: Respiratory (COPD, OSA), Cardiovascular (HTN, MI, arrhythmia), Renal (renal dysfunction), Metabolic/Endocrine (liver dysfunction, thyroid

disorder, DM), Behavioral (depression, cognitive impairment/dementia), and Hematology/Oncology (anemia, cancer).

In conclusion, community-based findings show that, on average, individuals with CHF have at least two other comorbid conditions (Chamberlain et al., 2015; Manemann et al., 2016). These comorbidities on top of CHF are concerning because the former can precipitate CHF exacerbation leading to hospital readmissions or even death (Chamberlain et al., 2015). Thus, there is a need to shift away from single-disease paradigms toward more holistic population-based health interventions in order to reflect the effects of comorbidities in controlling CHF readmissions. These conditions, which may not be directly related to CHF itself in management as well as pathophysiology, can still present negative impacts in regards to care coordination, drug interaction, and symptom management of CHF (Chamberlain et al., 2015). For example, persons with CHF in their early stage of dementia may not be able to remember whether or not they had taken their medicine and may end up either not taking it at all or taking an extra dose. This can negatively affect the individual person's treatment plan. Thus, in essence, comorbidities are as important as CHF itself in understanding the dynamics and issue of CHF readmission.

Hospital-Based Management of CHF Readmissions

At present, hospitals develop and implement most interventions to address the issue of CHF readmission. This is understandable because of the current penalties imposed upon them. The Hospital Readmission Reduction Program (HRRP) has authorized the Centers for Medicare and Medicaid (CMS) to impose financial penalty by

reducing monetary reimbursements to hospitals with higher-than-expected readmission rates for certain index condition including CHF (Hummel et al., 2014; Lavenberg et al., 2014; Soundarraj et al., 2017). Hospitals with higher-than-expected readmissions including CHF are penalized a percentage point of their total reimbursement from CMS up to 3% in year three of the program (Kripalani et al., 2014). The primary goal, of course, is to motivate healthcare institutions to improve their quality performance to hospitalized patients with CHF and other chronic conditions (Huesch et al., 2013).

Hansen et al. (2011) performed an exhaustive review of 43 studies on the interventions to lower 30-day hospital readmissions. Fifty six percent of these studies tested single-component management and the remaining (44%) tested multi-component interventions. Overall, the literature showed that single interventions were unlikely to significantly reduce readmission as compared to multifaceted interventions (Kripalani et al., 2014). In summary, the multi-faceted interventions included the following: pre-discharge interventions to include provision of health education to patient and family members, timely discharge planning, medication reconciliation, and hospital staff arranging for the first follow-up appointment even prior to discharge; and post-discharge interventions such as hospital phone calls to the patient as a follow up, involvement of the patient's primary care provider, availability of a patient Hotline, and a transition coach as a "bridge" intervention between the hospital and community settings (Hansen et al., 2011).

One program that showed a promising result was the Project Reengineering Discharge (RED) which was developed and piloted at Boston University Medical Center

in Boston, Massachusetts (Markley et al., 2012). The main feature of this project was that it focused on patient and family education, hospital case manager scheduling follow-up appointments, medication reconciliation with the patient's output, copy of discharge summary sent directly to patient's primary care provider, assessment of patient's understanding of the discharge plan, and a telephone call after discharge (AHRQ, 2013). Interestingly, it is worthwhile to note that the program resulted in a 30% decrease in hospital utilization by these individuals, which translated to preventing one in every seven patients from visiting the ED (AHRQ, 2013). In addition, it showed an approximate \$412 savings in 30 days following hospital discharge for individuals under this project compared to those who did not participate, or a 33.9% decrease in cost (AHRQ, 2013).

Another hospital-based program developed was the utilization of trained volunteers who were solely focused on educating patients with CHF about their disease, medication, and diet adherence while they were in the hospital and a weekly phone call for a month after their discharge (Sales et al., 2013). These volunteers were students pursuing a premedical track who underwent training from a cardiologist, nutritionist, and registered nurse. This was the focus of a study conducted in New York by Sales et al. (2013) who analyzed the effectiveness of trained volunteers in reducing 30-day readmission of CHF patients. The study showed that these trained volunteers resulted in a significant reduction in 30-day readmission rates and an increasing trend to fewer episodes of worsening New York Heart Association (NYHA) Class designations (Sales et al., 2013). The NYHA classifies patients with heart failure according to the severity of

symptoms from Class I (no limitation of activity) to Class IV (unable to carry out any physical activity without discomfort) (AHA, 2018). As compared to the nurse-led education alone, with the addition of trained volunteers, readmission rates from this group were at 19% compared to 7%, respectively (Sales et al., 2013). One reason is that, as mentioned, these volunteers were only focused on educating these patients whereas normally the task of educating these patients was just part of the routine performed by the hospital healthcare providers like nurses and case managers. However, one weakness of this study is its small sample size—the study only included 137 patients from June 2010 to December 2010. In addition, as noted by the authors, the hospital where the study was conducted had a well-organized volunteer program and the trained volunteers for this study were students from surrounding universities and colleges. Thus, this may not be applicable to smaller hospitals without the strong presence of student-volunteers.

Overall, the HRRP that instituted penalties for hospitals for higher-than-expected readmission rates has highlighted many issues within the United States healthcare system in relation to readmissions. Indeed, it highlighted the fragmented United States healthcare delivery system. Once discharged, there is rarely a follow-up of the patient as far as their discharged treatment plan is concerned other than on their next follow-up visits with their private healthcare practitioner. Unfortunately, in general, healthcare practitioners in the primary care setting do not always have time and resources to adequately attend their patients' needs and issues (Gilstrap & Joynt, 2014). This is especially true for complex patients and those with multiple chronic issues such as individuals with CHF.

Thus, even hospital-led interventions would still require community-level or community-based follow-up after discharge when these individuals are in the community. This is because one way to prevent readmission due to illness exacerbation is to comply with the discharged treatment plan such as timely follow-ups with their healthcare practitioner as well as following the prescribed diet and medications. Thus, hospitals and communities are creating novel programs to improve care and reduce readmissions. Many hospital systems are developing partnerships with community physicians and local community hospitals to improve bidirectional communication to ease the discharge/transfer process and identify potential sources of readmissions (Gilstrap & Joynt, 2014).

To summarize, hospital-based interventions to reduce CHF readmissions still require a certain degree of reaching out to discharged patients to follow up their progress. This is necessary in order to assess and intervene as necessary before the patient develops another episode of illness exacerbation. Moreover, it is also imperative to develop collaboration between hospitals that implement these programs and stakeholders in the primary care and community setting. By collaborating with the available community resources, treatment plans can be made available to all stakeholders and timely interventions can be instituted before the patient develops full-blown illness exacerbation that may require re-hospitalization.

Community-Based Interventions Related to CHF Readmissions

As mentioned, hospital organizations are the ones that mainly tackle the issue of hospital readmissions. Nevertheless, despite these efforts, the readmissions rate,

especially for CHF, remains high (Chen et al., 2016; Regenstein & Andres, 2014; Sales et al., 2013). Some have suggested that in order to stimulate creative and sustainable improvement, quality improvement efforts should shift from organization-level initiatives by hospitals to community-level approaches (McHugh et al., 2016). McHugh et al. (2016) conducted a study on community-level quality improvement and the patient experience for chronic illness care. Basing from the results of the study, the authors suggested that community-level quality improvement efforts led by multi stakeholder alliances hold the potential to improve patient satisfaction and receipt of recommended care (McHugh et al., 2016). While this study was focused among individuals with DM, it certainly reflects any chronic disease like CHF.

Transition from acute care to outpatient setting has shown to be very significant and at the same time to be a critical period for a discharged individual. This is because individuals with chronic illness, especially CHF, are at risk at this period from illness exacerbations (Whitaker-Brown et al., 2017). Whitaker-Brown et al. (2017) studied the quality of life and decreasing readmissions from CHF in a multidisciplinary transition-to-care clinic. Transitional care helps ensure continuity of care that is focused on preventing illness exacerbation, quality of life, and symptom management through health education and support to patients and their families. This was a pilot study on the feasibility of a 4-week transition-to-care program on the quality of life of CHF patients. The one strength of this study was that pre- and post-test design was used wherein the participants completed a pre-test prior to the beginning of the program and post-test was administered at the end of the program. Nevertheless, the sample was small using convenience

sampling of 50 participants; thus, the result cannot be generalized to other populations. As a pilot study, however, it can be used as a pattern for a larger study. Interestingly, the authors found that the support provided by this clinic has improved quality of life and decreased readmissions for heart failure patients. This is also the finding from the study conducted by Russell et al. (2011). In their study on the community-based partnership between the certified home a healthcare agency and a hospital, Russell et al. (2011) found that patients who received transitional care services were significantly less likely to be readmitted than patients who did not receive such services.

Feltner et al. (2014), on other hand, studied the efficacy, comparative effectiveness, and harms of transitional care interventions to reduce readmission and mortality rates of adults hospitalized with CHF and found that home-visiting programs and multidisciplinary (MDS) heart failure clinic interventions reduced all-cause readmissions. Although there was a little evidence on whether interventions reduced 30-day readmissions, the authors found out that these programs had significant evidence for reducing all-cause readmissions and mortality up to six months after an index hospitalization for persons with CHF (Feltner et al., 2014). This points out the necessity of having robust community-level home visit programs as well as heart failure clinics to cater to the needs of discharged individuals with CHF.

The home visit program is designed wherein a clinician like a nurse or pharmacist would schedule a visit to the person's place and conduct health education, reinforce discharge instruction, and perform a physical examination (Feltner et al., 2014). Murtaugh et al. (2017) conducted a study on reducing readmissions among heart failure

patients discharged to home health care, and found that early nursing services and at least one outpatient physician visit in the week after discharge reduced the risk of 30-day hospital readmission. The authors concluded that closer coordination between home health and medical providers in the management of CHF individuals immediately after hospital discharge is needed in order to achieve the goal of improving CHF patient care (Murtaugh et al., 2017). Chen et al. (2016) analyzed the impact of rurality on heart failure Medicare beneficiaries who received home health services for post-acute care after hospital discharge. The authors found out that home health beneficiaries in remote rural areas had 27% lower 30-day preventable readmission than those in urban areas (Chen et al., 2016).

Outpatient heart failure clinics provide clinic-based interventions as well as unstructured telephone support outside clinic hours. In California, a specialized CHF clinic is focused on visits with goals to identify precipitating factors to improve medication adherence and enhance patient education on fluid and salt restriction in a multidisciplinary manner (Jackevicius et al., 2015). This means that patients were seen by a team composed of physician assistants, clinical pharmacists, and case managers. Jackevicius et al. (2015) studied the impact of this program and they found that the multidisciplinary post hospitalization program was associated with a reduction in 90-day CHF readmission. This was a retrospective cohort study with 277 participants—144 clinic, and 133 control. A limitation of this study was that there was lack of randomization. Individuals with a primary diagnosis of CHF who were discharged alive

were the target population for inclusion. In addition, the authors acknowledged that the sample was small.

Fisher et al. (2015) analyzed and discussed key features of “peer support” from community health workers in chronic disease prevention and management worldwide. They found out that there is substantial evidence for both the effectiveness and the cost-effectiveness of this kind of support, as well as for its feasibility, reach, and sustainability. The success factors of community health workers’ peer support, according to the authors, include proactive implementation of daily health management, attention to participants’ emotions, and ongoing supervision and training of other peer supporters (Fisher et al., 2015). Through support from community health workers and others from community and healthcare organizations, reaching those whom conventional clinical and preventive services may fail to reach, reaching whole populations such as people with diabetes or CHF as a whole rather than selected samples, and addressing behavioral health are all strengths of peer support that can help achieve healthcare that is efficient and of high quality. In a study conducted among the low-income Asian-Americans with DM in Santa Clara, California, Seto et al. (2012) found that a registry that a local public health office maintained was significant in increasing level of compliance of the participants to their treatment regimen by conducting home visits and telephone calls to remind them of their appointments (Seto et al., 2012).

Transitional care models present interesting opportunities for both hospitals and community-based organizations to improve quality of care for complex patients. Individuals with CHF represent one of the biggest group most prone to high risk across

healthcare settings for illness exacerbation and therefore possible readmission (Russell et al., 2011). In summary, these community-based interventions were focused on assisting the individual comply with his or her discharge treatment plan. Interestingly, the transition from a hospital to a community setting has been shown to be a critical time because it is the phase where the individual is more prone to exacerbation (Whitaker-Brown et al., 2017). Thus, to address this problem, transitional care programs of varying length have been implemented. The most common transitional care interventions involved home-visiting programs and outpatient clinic-based programs (Feltner et al., 2014). The main goal was to ensure continuity of care, thus reducing readmission. Its intention, however, is to complement and not to replace primary care, disease management, or case management by educating patients and their caregivers about the illness and the available community resources (Whitaker-Brown et al., 2017). In the end, the individual person has to be responsible for illness management while he or she is in the community.

Despite all these attempts to address readmissions through these community-based interventions, there are still gaps in readmission particularly at the community level that need further analysis. Any successful initiative is dependent on the extent to which the clinicians and administration as well as program planners would successfully implement the different components of the program as well as the level of receptivity of the concerned individual and his/her family to take responsibility for self-care and self-management. Are these programs readily available to the concerned individuals and their families? Are these programs accessible? Are they affordable? Are they acceptable to the

supposed recipients of care? It is imperative to understand and analyze these factors that affect the readmission of individuals with CHF.

Community Level CHF Self-Management

In order to optimally manage CHF while the person is in the community or outside the hospital, he or she must make a health behavior alteration alongside day-to-day activities. This means that he or she should self-manage. One solution is to refer individuals with CHF or other chronic diseases to community-based resources that can help them develop the necessary skills and knowledge on how to manage their illness (Liddy et al., 2016).

Dube et al. (2017) explored self-management needs of patients with chronic diseases in South Africa. This was a qualitative study on the experiences and perspectives of individuals with chronic diseases in their natural environment and the interviews were conducted in the language of the participants. The authors considered this as a limitation of the study because it limited the degree of rapport between the researcher and participants (Dube et al., 2017). I consider this however as one of its strengths. Conducting the interviews in their native language enabled the participants to express their opinions better. In addition, the authors of this study utilized a trained facilitator who was fluent in both the English language and the local vernaculars. In this study, Dube et al. (2017) were able to identify a number of themes. These themes included healthcare provider attitudes and behavior, adherence challenges related to medication and lifestyle changes, and the patients' personal and clinic experiences (Dube et al., 2017). While this study was conducted in South Africa, the above themes emerged from

this study can be helpful in understanding and applying community-based readmission programs in the United States. In addition to the program itself, the attitude and behavior of the healthcare providers towards the individual client and his family is a significant factor whether or not the latter would utilize the existing community resources. An individual who finds their healthcare provider to be respectful of their culture or belief system tends to report a more positive professional relationship with the healthcare provider individuals (National Prevention and Information Network, 2014). Moreover, consumers of healthcare tend to trust more and utilize more health services that respect their culture (CDC, 2014). Similarly, a study among Chinese-American immigrants with Type 2 DM on the efficacy of culturally-adapted training was done by Chesla et.al. (2013). The results of the study showed a significant improvement in the blood sugar of the participants after the researchers utilized culturally adapted cognitive-behavioral interventions (Chesla et al., 2013).

Moreover, a study was conducted in Canada on the effectiveness of a community-based program that coordinates, promotes, and facilitates self-management programs (Liddy et al., 2016). The authors concluded that a community-based self-management program working in partnership with primary care could be successfully implemented to support individuals with chronic diseases (Liddy et al., 2016). In addition, in a study conducted in Mexico, De Cordova et al. (2017) assessed the effectiveness of a Spanish language version of the Stanford Chronic Disease Self-management Program (CDSMP) among individuals who received medical care in community health centers in Mexico. The authors concluded that CDSMP with Mexican adults in community settings were

effective in improving their health and self-management behaviors (De Cordova et al., 2017).

Moreover, Hatch et al. (2017) studied and focused on chronic disease biomarkers in Oregon among community health center (CHC) patients who gained Medicaid coverage and showed that cohorts, compared to matched uninsured patients, were significantly more likely to have better follow-up-controlled measurement—hemoglobin A1c as well as systolic and diastolic blood pressure. Thus, the authors concluded that patients with uncontrolled chronic conditions experienced objective health improvements over time (Hatch et al., 2017). This demonstrated the effectiveness of care provided by CHCs who provide consistent source of care. In addition, while both insured and uninsured patients experienced improvement in biomarkers over time, patients who gained Medicaid coverage were more likely to achieve control within the study period (Hatch et al., 2017). Moreover, in a study on community health worker (CHW) support for disadvantaged patients with multiple chronic diseases using participatory action research, Kangovi et al. (2017) found out that a standardized CHW intervention basically improved chronic disease control, mental health, quality of care, and hospitalization among the participants in a high-poverty neighborhood. A study in western Iran had a similar conclusion wherein home-based face-to-face education by community health volunteers (CHVs) improved self-care maintenance and self-care management of individuals with CHF and was at par with the education provided by healthcare professionals in formal setting (Soraya et al., 2016). Lastly, Kim et. al. (2016) conducted a systematic review on the effects of community-based health worker (CBHW)

interventions on chronic disease management and care. The roles of the CBHW included health education, counseling, navigational assistance, case management, social services, and social support (Kim et al., 2016). After analyzing 67 articles, the authors concluded that interventions by CBHW can be effective and cost-effective especially in communities of low-income, underserved, and racial and ethnic minority groups (Kim et al., 2016).

One advantage is that local CHWs often share with or understand the socioeconomic, linguistic, and cultural background of the participants. Culture is an important factor to consider in treatment compliance (CDC, 2014). This is because all cultures have belief systems about disease causality, treatment, as well as who should be included and involved in the process (National Prevention and Information Network, 2014). Moreover, culture has an impact on the health-seeking behavior of the person (Kim et al., 2016). Therefore, a person seeking healthcare services will likely trust, listen, and adhere to the treatment modality from a provider who respects or understands their culture (CDC, 2014). This puts the local CHWs in a unique position to influence the latter a comply with a discharged treatment regimen. In other words, local CHWs have a significant role in facilitating community-based health promotion programs (Kim et al., 2016).

Summary

In summary, despite numerous interventions, the prevalence and incidence of CHF readmissions are still an issue in the American healthcare system in general. The problem of CHF readmission continues to be a burden to the healthcare system (Fisher et

al., 2015). The issue of CHF readmission spans across the acute care settings where the individual is hospitalized during illness exacerbation, and to the community where he/she lives during illness remission. In general, factors that can be inherent to the individual, the community where he/she resides, and the quality of care affect CHF readmissions (Soundarraaj et al., 2017). These factors that affect readmissions must therefore be seen as interdependent among each other and must be further analyzed in order to create more inclusive, more affordable, more accessible, more available, and more acceptable programs for the individual, family, and communities affected by CHF readmissions.

Definitions

Activities of daily living (ADL): include basic skills needed to manage physical needs related to personal care, mobility, and eating like dressing, toileting, and walking (Mlinac & Feng, 2016).

Dementia: a term used to describe a group of symptoms related to deterioration in memory and other thinking skills resulting in impairment in performing activities of daily living (Alzheimer's Association, 2018).

Depression: a mood disorder characterized by a persistent feeling of sadness that can affect how one feels, thinks, and behaves (Mayo Clinic, 2018).

Chronic disease: a disorder characterized by long duration or frequent recurrence, usually incurable and progressive but not immediately fatal like DM, CHF, and COPD (Schneider, 2011).

Comorbidities: the patient's other chronic health conditions other than CHF (Triposkiadis & Skoularigis, 2012).

Ethnicity: determines whether a person is of Hispanic origin or not, which is broken into two categories—Hispanic or Latino, and Not Hispanic or Not Latino (U.S. Department of Commerce, 2017).

Healthcare Practitioner: an individual who is licensed or authorized by the State to provide healthcare services (U.S. Department of Health and Human Services, *n.d.*). He or she may be a Medical Doctor (MD), Nurse Practitioner (NP), or Physician Assistant (PA).

New York Heart Association (NYHA) Functional Classification of CHF: classifies the person's level of heart failure according to the severity of symptoms: Class I—no limitation of physical activity; Class II—slight limitation of physical activity, ordinary activity results in fatigue and shortness of breath but comfortable at rest; Class III—marked limitation of physical activity but comfortable at rest; Class IV—unable to carry out physical activities without discomfort (AHA, 2018).

Primary Care Provider: a physician, nurse practitioner, clinical nurse specialist, or physician assistant who provides, coordinates, or helps patient access a range of healthcare services (CMS, *n.d.*). In this study, this term can be used interchangeably with Healthcare Practitioner.

Race: refers to the patient's recorded racial background. It is defined as the person's self-identification with one or more social groups namely as White, Black, Asian, Native American and Alaska Native, Native Hawaiian and other Pacific Islanders, or some other race (U.S. Department of Commerce, 2017).

Socioeconomic Status (SES): refers to the level of education, income and occupational status of the patient (Schneider, 2011).

Assumptions

In this study, I used secondary data from individuals with CHF who have experienced at least more than one admission or one readmission within a 30-day period from a community hospital in northern Virginia from July 2014 to December 2017. I assumed that these individuals or their designated caregivers or Power of Attorneys (POAs) answered the hospital admission database questionnaires correctly. I also assumed that everything that was charted by any member of the healthcare team for each patient was factual. Lastly, I assumed that the data of each patient is complete. The truthfulness of all information from the patients' electronic medical records (EMRs) was necessary to create data that mirror the actualities in the field and the impact of the factors being studied. This, in turn can create better generalizability for the CHF populations in northern Virginia.

Scope and Delimitations

In this study, I attempted to analyze the factors that affect 30-day CHF hospital readmissions. These factors were delimited to the patient's payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities. I obtained the data from records of patients with CHF who were readmitted at least once within 30 days from a local hospital in northern Virginia from July 2014 to December 2017. I excluded from this study individuals who were just visiting the area who happened to be readmitted due to

CHF exacerbation whose addresses were other than within the jurisdiction of the catchment area of the hospital.

I based this study from the social ecology model for health promotion, one of the ecological models of health behavior. Another theory that is closely related to its concept and can be used for related studies on CHF readmission especially in relation with compliance to treatment is the Health Belief Model (HBM). This theory posits that the individual's thinking of a threat posed by a health problem and the value associated with actions aimed at reducing that threat affect his or her health-seeking behavior (Glanz et al., 2008). The main components of this model include perceived susceptibility, perceived severity, perceived benefits and costs, barriers, motivation, and enabling or modifying factors (Polit & Beck, 2012). Nevertheless, one limitation of this theory is that it does not take into account environmental and economic factors, which are the independent variables in this study that may hinder or promote the recommended action (Boston University School of Public Health, 2013). For example, the lack of health insurance among individuals with chronic diseases who cannot afford it would prevent them from buying needed drugs even though they are aware of the complication of not taking the needed medications. Lastly, the result of this study could be generalizable to individuals with CHF who experienced at least one hospital readmission within a 30-day period in northern Virginia.

Significance, Summary, and Conclusion

This study was focused on socioeconomic and health-related factors that affect 30-day CHF readmissions. Understanding the relationships of these factors can enrich the

public health body of knowledge. This is necessary because CHF readmissions are currently and basically seen from the acute care point of view. By looking into these factors through a public health lens, this study can contribute by placing public health as equally as an important partner in controlling readmissions.

By understanding these factors, this study can contribute to enriching the community-based literature on health promotion and illness prevention particularly on CHF. As such, the result can be used wholly or partly to create community-based public health programs that can benefit the individual, family, and the community. In the end, this study through the creation of community-based programs to control readmission can have effects on health expenditures and more importantly, can foster better health outcomes especially among the poorer members of the society.

It is interesting to note that hospital readmissions cost the government about \$15 to \$17 billion annually (Lavenberg et al., 2014). By focusing on preventing CHF exacerbation, ER visits and consequently readmissions can be prevented, helping decrease the cost of healthcare. Secondly but more importantly, this study can have a significant impact on the issue of health inequity and disparity. Unfortunately, Medicaid patients are readmitted more than the other group particularly among individuals with private insurance. For individuals with CHF, Coffey et al. (2012) found that the 30-day Medicaid readmission rate is 52% and 87% higher than Medicare and private insurance rates, respectively. This means that this group suffers more from frequent readmissions than the other groups. Therefore, results of this study may inform community health-related programs or services that are focused on improving quality of life of especially

the disadvantaged members of society who struggle with illness exacerbation while they live their lives in the community. While study findings may be helpful to all who are frequently readmitted due to CHF exacerbation, they may particularly benefit individuals who are on Medicaid or other forms of public insurance.

Lastly, this study can contribute to positive social change. Unfortunately, the individuals who are affected the most by readmissions are the poor, the sick, and the elderly. By analyzing these factors, the issue of health disparity and inequity can be addressed. Strong and research-based data are necessary to create strong and meaningful public health programs for these vulnerable groups in our society. By understanding these factors that may be unique to these groups, public health programs can be created that are specifically patterned to these groups rather than generic programs that aim to cater to everyone without consideration to a group's specific circumstances and special needs.

While there are hospital-based management and community-based interventions as well as community-level self-management processes geared towards preventing CHF readmissions, this problem still persists. The literature review shows that individuals with CHF on the lower socioeconomic strata are affected most by hospital readmissions. These are individuals who usually rely on a government-assisted form of insurance or even none at all. In addition, the presence of an immediate patient support system like family member is also significant in preventing readmission because he or she can assist, remind, and encourage the individual to comply with a treatment regimen like proper diet, medication compliance, and timely outpatient appointment. Other factors are the person's cognition level and the presence of other comorbid conditions. It is imperative to

analyze which of these factors, singly or in combination, have the greatest impact in preventing CHF readmissions.

Section 2: Research Design and Data Collection

Introduction

The purpose of this study was to fill in the literature gap on the factors that affect CHF readmissions from the public health point of view and analyze these socioeconomic and health-related factors associated with hospital readmissions. These included the presence of other comorbidities, patient demographics, payer status, and living arrangements, as an indicator of social support (Chamberlain et al., 2017; Regenstein & Andres, 2014; Rubin et al., 2014; Triposkiadis & Skoularigis, 2012).

This section contains the Research Design and Rationale, Research Methodology, Threats to Validity, and Summary. The Methodology includes the study Population, Sampling and Sampling Procedures, and Instrumentation and Operationalization of Constructs.

Research Design and Rationale

This was a retrospective case control quantitative study. Retrospective design is one in which a phenomenon existing in the present is linked to a phenomenon or phenomena that occurred in the past (Polit & Beck, 2012). In this study, I analyzed the data from individuals or patients with CHF who were admitted and who met the criteria and compared them with the data from individuals or patients who experienced being readmitted more than once within a 30-day period from July 2014 to December 2017 to find out possible factors that may affect the individual's hospital readmission. In this study, I observed, described, and documented the association between and among CHF

hospital readmission as the dependent variable and payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities as independent variables.

Case control is a study in which the question of interest is whether or not there is association between a particular risk factor or exposure, and an outcome (Sullivan, 2012). In this doctoral study, I analyzed various factors (exposure) and their possible association with CHF readmission (outcome). Case control was appropriate for this study because the outcome of interest (CHF readmission) is very specific: The number may be limited and therefore, is considered “rare.” According to Sullivan (2012), other methods like cohort may not be efficient when the outcome of interest is rare because they require a large number of participants to be enrolled in order to create a sufficient number of outcome events. As case control, I identified the participants on the basis of their CHF readmission status as cases (readmission case) from CHF patients admitted to the hospital as the control group.

Methodology

Population

Included in this study were secondary data from CHF patients who were admitted to a particular northern Virginia hospital with the following ICD 10 codes:

I 11.0—Hypertensive Heart Disease with Heart Failure

I 13.0—Hypertensive Heart and Chronic Kidney Disease with Heart Failure and Stage 1 through 4 Chronic Kidney Disease

I 13.2—Hypertensive Heart and Chronic Kidney Disease with Heart Failure and with Stage 5 Chronic Kidney Disease, or End-stage

I 50.1—Left Ventricular Failure, Unspecified

I 50.20—Unspecified Systolic (Congestive) Heart Failure

I 50.21—Acute Systolic (Congestive) Heart Failure

I 50.23—Acute on Chronic Systolic (Congestive) Heart Failure

I 50.30—Unspecified Diastolic (Congestive) Heart Failure

I 50.31—Acute Diastolic (Congestive) Heart Failure

I 50.32—Chronic Diastolic (Congestive) Heart Failure

I 50.33—Acute on Chronic Diastolic (Congestive) Heart Failure

I 50.40—Unspecified Combined Systolic (Congestive) and Diastolic (Congestive) Heart Failure

I 50.41—Acute Combined Systolic (Congestive) and Diastolic (Congestive) Heart Failure

I 50.42—Chronic Combined Systolic (Congestive) and Diastolic (Congestive) Heart Failure

I 50.43—Acute on Chronic Combined Systolic (Congestive) and Diastolic (Congestive) Heart Failure

I 50.9—Heart Failure, Unspecified

The patient population included those who were adults at least 18 years of age on admission and who came from home, Assisted Living Facilities (ALFs), Skilled Nursing Facilities (SNFs)/Rehabilitation Centers, correctional facilities, and group homes or shelters.

Records show that in 2012 (the most recent data available), there were approximately 1887 cases of CHF in the northern Virginia area (Northern Virginia Health Foundation, 2013). In addition, the 2012 racial population estimates in the area were Asian 15%, Black 7%, White 68%, Hispanic 12%, Others/Multi Race 9% (Northern Virginia Health Foundation, 2013). In Loudoun County, the 2016 racial demographics show that there were 18.7 % Asian, 7.7% Black, 69.3% White, 0.1% Hawaiian/Pacific Islander, 0.2% Native American/Alaskan Native, and 1.6% for two or more races (mixed) (Loudoun County Government, 2017). It must be understood, however, that the Hispanic population was not included in the Loudoun County data because the same paper mentioned that Hispanic is an ethnicity not a race, therefore, they can be of any race. From 2000 to 2016 however, Loudoun's Hispanic population went from a share of 5.9% (10,091) to 13.7% (51,964) making the county the third highest population and the 11th highest concentration of Hispanic residents in Virginia (Loudoun County Government, 2017).

Sampling and Sampling Procedures

I included in this study patients with CHF who were admitted to a northern Virginia hospital from July 2014 to December 2017. From these admitted patients, I divided them into two groups. One group, the case group, were patients who experienced at least one incidence of readmission within 30 days of hospital discharge. The second group, the control group, were patients who were admitted but never were readmitted within thirty days after hospital discharge. I excluded from this study patients who were considered visitors in Loudoun county who were just admitted to this hospital on the

course of their stay within the area. In order to know whether or not the patient is just visiting the area, I checked his or her place of residence or address. The patients' record and visitor status could also be read in the progress notes of healthcare workers, particularly from the case managers. The progress notes of all healthcare workers, which were written during the patient's hospital stay automatically become part of the patients' medical records once they are discharged. To check for this, I looked for keywords like *visitor*, *out of state*, *visiting* in the progress notes.

Initial data from the hospital showed that there were 3450 cases of CHF admissions from all age and all payer status from July 2014 to December 2017. Out of these, there were 490 readmission cases. I analyzed secondary data from the admission cases and readmission cases.

This study included 450 participants. I used systematic sampling for both the number of case and control. Systematic sampling involves selecting every k th case from the list (Polit & Beck, 2012). As suggested by the authors, the desired sample size is established at some number (n). The size of the population must be known or estimated (N). By dividing the N with n , the sampling interval is established ($k = N/n$). For example, if there were 300 total admitted patients (N) and there were 50 Readmitted (n), $k = 300/50 = 6$. Thus, every sixth element on the Admission list will be taken as a sample until it reaches the desired number. I selected randomly the first element.

The healthcare organization where these patients were hospitalized has its own policy in accessing data from the client population for any research, quality improvement (QI), or evidenced-based Project (EBP) through its IRB. The organization's IRB requires

the researcher to have CITI or a Human Subject Research Training certificate. Thus, I underwent such training to get the needed certificate. Moreover, the hospital IRB also requires an e-protocol number, which I obtained. This is available solely for employees of the organization as well as medical staff with active privileges to the organization's hospital campuses.

To start the approval process on the part of the organization, I submitted a copy of my research proposal to the research council of the hospital for approval before submitting to the IRB. After this, the proposal was submitted to the IRB. Once the study was approved by the IRB, I sent a letter to the organization's academic, clinical placement, and policy coordinator for professional practice to start the formal conduct of the study. In addition, I also sent a copy of the approval letter to the organization's research council. I was given an official ID badge that clearly stated my school and the degree I was pursuing. This badge was worn all the time whenever I was at the facility gathering data. The office of Quality, Performance Improvement and Outcome of the hospital was also informed and through its office, I obtained the list of CHF readmission cases. The list included the patient's full name, date of birth, and medical record number. I accessed the patient's data by looking into his or her unique medical record number (MRN).

This MRN is automatically generated by the Epic software after a person is registered on his or her first ER visit. This is a unique number and no individual has the same medical record number. The same number is used for succeeding ER visits. To access the MRN and consequently the patient's medical record on succeeding ER visits,

the patient was asked for their full name, date of birth and address. Another safety question to ensure correct matching to previous records is to ask the person if they had ever visited the hospital ER before and the name that was used before (maiden name, married name, and spelling) and the address.

Power Analysis

Some previous studies related to CHF readmissions that have similarities with my study that I reviewed showed that the number of participants ranged from 50 to 1,764. Whitaker-Brown et al. (2017) conducted a pilot study on the quality of life of CHF patients using convenience sampling of 50 persons in which 36 (72%) completed the study. On other hand, Hummel et al. (2014) studied data from 1764 survivors from 14 community hospitals in Michigan on the impact of prior admissions on 30-day readmissions in Medicare heart failure patients. With 14 hospitals, the authors were able to acquire 1,764 participants. In my study, however, I only analyzed data of patients from one northern Virginia hospital.

Other studies included a retrospective study in California on the impact of a multidisciplinary heart failure post-hospitalization program on CHF readmission rates with 277 participants conducted by Jackevicius et al. (2015) and a study in China on the reduction of HF rehospitalization using weight management education intervention by Xiao-Hua Wang et al. (2014) with 66 participants; 32 of them assigned to the intervention group and 34 to the control group. There was also a study in Japan by Kaneko et al. (2015) on the incidence and predictors of rehospitalization of CHF patients utilizing 282 discharged patient data. Moreover, a study in Florida on the predictors of

30-day readmission in hospitalized patients with decompensated CHF utilized clinical data from 412 discharged patients (Hernandez et al., 2013). Lastly, a study in New York by Sales et al. (2013), on the utilization of trained volunteers in decreasing 30-day readmission for CHF, utilized 137 patients.

In order to determine the number of participants to maintain power, I performed power analysis. Power analysis is used to lower the risk of Type II errors and strengthen the statistical conclusion validity by estimating how big a sample is needed (Polit & Beck, 2012). Using Power 3, G*Power, power analysis was done given: alpha = 0.05, Power = 0.80, statistical test: Logistic regression, test family: z-tests, type of power analysis: a priori, effect size: 1.5; background prevalence: 0.2. Effect size is a statistical expression of the magnitude of relationship or magnitude of difference between variables or group (Polit & Beck, 2012). Result of power analysis yielded 308 participants. In this study, I used 450 participants to maintain statistical power.

Instrumentation and Operationalization of Constructs

Every patient who visits the hospital's ED, whether he or she is admitted, will have a unique MRN. All records from all hospital visits are stored electronically. A patient's medical record can be accessed in different ways and the fastest is through their MRN. Thus, I used the patients' MRNs to access their data since the Office of Quality, Performance Improvement and Outcome already has the list of these patients.

The dependent variable of this study was CHF readmission. This happens when an individual with CHF is being admitted at least for the second time within a 30-day period from first admission. I compared the cases of readmission (readmission counts)

with data from individuals who were admitted due to CHF but did not meet the readmission criteria; that is, they were not readmitted within the 30-day period after their previous admission (outcome cases). A bivariate table was created to show which among the patients were readmitted or not (yes/no).

The independent variables included payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities. Payer status denotes the person's source of payment for his/her healthcare and health needs. These include Medicare, Medicaid, private insurance, combination, or self-pay (absence of insurance). This information can be found in the patient's medical record face sheet and/or case manager's progress notes. Race is the person's recorded racial background. This was measured as White, Black, Asian or Pacific Islander, Native American or Native Alaskan, or combination/mixed. Ethnicity describes whether the individual is Hispanic/Latino or Not Hispanic/Not Latino. The patient's medical record face sheet contains his/her personal information including his or her racial and ethnic background. Primary language spoken is the patient's preferred language to use to communicate daily needs, and receive health and other forms of instruction. Among Loudoun County residents, 31.7% of the residents spoke a language other than English at home and 10.3% among the residents spoke English "less than very well" (Loudoun County Government, 2017). Moreover, according to the Loudoun County Government (2017), the following are the top languages spoken among residents with limited English proficiency (LEP): Spanish, Korean, Persian (Farsi), Chinese, Hindi, and Vietnamese (Loudoun County Government,

2017). In this study, primary language spoken will be measured as Spanish, Korean, Persian (Farsi), Chinese, Hindi, Vietnamese, and Others (please specify).

Living Arrangement describes where the person resides or who the person lives with and measured whether he/she lives alone, lives with family members or significant others, lives in ALF, lives in SNF, lives from a group home, or came from correctional facility. This information can be obtained from the ED progress notes and/or case manager's progress notes. Comorbidities are the person's chronic health-related conditions other than CHF and are part of the patient's past medical history (PMH). These patient's comorbid conditions can be found in the physician's progress notes and in the patient's admission database. These comorbid conditions are part of the patient's medical history that include diagnosed medical, psychiatric and/or surgical conditions. In addition, healthcare practitioners gather other comorbid conditions from the patients and/or their family during health assessment. A patient's record does not however, always identify or differentiate diagnosed and self-report conditions. I considered all listed comorbidities in the patient chart. In this study, I analyzed the identified CHF comorbidities from literature—namely, major depressive disorder, cognitive impairment (dementia and Alzheimer's), HTN, arrhythmias (atrial fibrillation/atrial flutter, ventricular tachycardia/ventricular fibrillation and heart blocks), myocardial infarction or MI (ST Elevation MI or Non-ST Elevation MI), COPD, OSA, chronic renal failure (CRF)/end-stage renal disease (ESRD), liver failure/cirrhosis of the liver/hepatitis, DM (Type 1 or 2), thyroid dysfunction (hypo-or hyper thyroid), and malignant neoplasia/cancer (all case)—and tested their relationship with the dependent variable.

Based on prior work conducted by Campbell and colleagues (2017) on chronic diseases, they identified a number of covariates that have shown to be associated with hospitalization. CHF is a chronic disease and I considered these factors, too, as covariates in this study. These included age, and sex. Age is very important to consider. For example, among in the 25—44 years age group, heart disease that includes CHF is the number three cause of mortality but ranked second for age group 45—64 years and jumped to the number one cause for age group 65 years old and above (Aschengrau & Seage III, 2014). Sex, that is, whether the patient is male or female, was also treated as covariate since this variable is not part of socioeconomic and community health-related factors.

Missing Values

A very important step in analyzing missing data is to assess the extent of the issue by examining the frequency distribution on a variable-by-variable basis and to examine the cumulative extent or effect of the missing values (Polit & Beck, 2012). For example, how many cases had no variable missing, one variable missing, and so on? Another step or task is to assess the randomness of the missing value (Polit & Beck, 2012). For example, if the missing value is the living arrangement, is there a particular group that does not have this value? In this study, I handled the missing value by applying the most widely used approach, which was to delete the cases selectively on a variable-by-variable basis by means of pairwise deletion (also called *available case analysis*) (Polit & Beck, 2012). In this process, I only analyzed the available values. For example, if 10 out of

1,000 cases did not have data on living arrangement and 5 did not have data on ethnicity, I intended to analyze 990 cases for living arrangement and 995 cases for ethnicity.

Data Cleaning

Since the cases of hospital CHF admission and readmission have been properly coded internally by the hospital as required by law, the data were considered “clean.” The EMR of each patient and its layout in EPIC is consistent and follow the same guideline and organization. This means that the same questions and formats are asked of all patients.

Data entry, however, from the hospital record to the study data file can be prone to error. To make sure that the data was encoded accurately, I compared visually the numbers from the study data file with the original source. However, even verified data still needed to be cleaned. Data cleaning involves two types of check—check for outliers and check for wild codes (Polit & Beck, 2012). Outliers are values that lie outside the normal range and can be seen by inspecting frequency distributions paying close attention to the highest and lowest values. Some outliers may be legitimate values but some may be from data entry error (Polit & Beck, 2012). The second one is the so-called wild code; that is, a code that is not possible (Polit & Beck, 2012). For example, under race, this study will have five codes for the three main racial groups and one for mixed race. If someone was coded 6 or 7, this can be an error. Thus, I checked this type of entry and I made sure that all data was entered correctly.

Data Analysis Plan

In this study, I tested the statistical relationship between 30-day CHF readmission and the following independent variables: payer status, race, ethnicity, living arrangement, and comorbidities. I attempted to answer the following research questions:

Research Question 1 (RQ1): What was the relationship between 30-day readmission of individuals with CHF and their payer status as measured by types of insurance or its absence?

Null Hypothesis (H_01): There was no relationship between 30-day readmission of individuals with CHF and their payer status as measured by type of insurance or its absence after adjusting for potential confounders.

Alternative Hypothesis (H_{a1}): There was a relationship between 30-day readmission of individuals with CHF and their payer status as measured by type of insurance or its absence after adjusting for potential confounders.

Test of Statistics: Chi-square test of independence; Logistic regression.

Research Question 2 (RQ2): What was the relationship between 30-day readmission of individuals with CHF and their race?

Null Hypothesis (H_02): There was no relationship between 30-day readmission of individuals with CHF and their race after adjusting for potential confounders.

Alternative Hypothesis (H_{a2}): There was a relationship between 30-day readmission of individuals with CHF and their race after adjusting for potential confounders.

Test of Statistics: Chi-square test of independence; Logistic regression.

Research Question 3 (RQ3): What was the relationship between 30-day readmission of individuals with CHF and their ethnicity?

Null Hypothesis (H_03): There was no relationship between 30-day readmission of individuals with CHF and their ethnicity after adjusting for potential confounders.

Alternative Hypothesis (H_a3): There was a relationship between 30-day readmission of individuals with CHF and their ethnicity after adjusting for potential confounders.

Test of Statistics: Chi-square test of independence; Logistic regression.

Research Question 4 (RQ4): What was the relationship between 30-day readmission of individuals with CHF and their primary language spoken?

Null Hypothesis (H_04): There was no relationship between 30-day readmission of individuals with CHF and their primary language spoken after adjusting for potential confounders.

Alternative Hypothesis (H_a4): There was a relationship between 30-day readmission of individuals with CHF and their primary language spoken after adjusting for potential confounders.

Test of Statistics: Chi-square test of independence; Logistic regression.

Research Question 5 (RQ 5): What was the relationship between 30-day readmission of individuals with CHF and their living arrangement?

Null Hypothesis (H_05): There was no relationship between 30-day readmission of individuals with CHF and their living arrangement after adjusting for potential confounders.

Alternative Hypothesis (H_{a5}): There was a relationship between 30-day readmission of individuals with CHF and their living arrangement after adjusting for potential confounders.

Test of Statistics: Chi-square test of independence; Logistic regression.

Research Question 6 (RQ6): What was the relationship between 30-day readmission of individuals with CHF and comorbidities in the dataset as identified in their medical record?

Null Hypothesis (H_{o6}): There was no relationship between 30-day readmission of individuals with CHF and comorbidities in the dataset as identified in their medical record after adjusting for potential confounders.

Alternative Hypothesis (H_{a6}): There was a relationship between 30-day readmission of individuals with CHF and comorbidities in the dataset as identified in their medical record after adjusting for potential confounders.

Test of Statistics: Chi-square test of independence; Logistic regression.

Research Question 7 (RQ7): What was the relationship between 30-day readmission of individuals with CHF and their payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities in the dataset as identified from their medical record?

Null Hypothesis (H_{o7}): There was no relationship between 30-day readmission of individuals with CHF and their payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities in the dataset as identified in their medical record after adjusting for potential confounders.

Alternative Hypothesis (H_{a7}): There was a relationship between 30-day readmission of individuals with CHF and their payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities in the dataset as identified in their medical record after adjusting for potential confounders.

Test of Statistics: Logistic regression.

I derived the descriptive measures from the dependent and independent variables by calculating their frequencies, means, and percentages. Moreover, to establish a relationship between and among the variables, I conducted inferential statistics with the result interpreted at 95% Confidence Interval (CI) and alpha level at 0.05. However, I tested for confounders all variables that passed the lower p-value threshold of 0.2. I used chi-square test of independence in the bivariate analysis of data between the binomial dependent variable and the nominal/categorical independent variables. Lastly, I used logistic regression model to determine which among the independent variables were predictive of readmission. I analyzed the data using the IBM SPSS Statistics 25 software. In order to determine the contribution of the independent variables to the dependent variable, I used the Stepwise approach. The aim was to develop a parsimonious model to come up with a good prediction equation; that is, to determine strong readmission predictors. One advantage of the Stepwise approach is that it can provide objective screening procedure for independent variables in developing prediction model.

I also planned for multicollinearity. In case there would be multicollinearity between the independent variables, one option was to drop the variable that was causing it. Another option was to retain all the variables. The latter was what I planned to do

because I wanted them all in the model to help understand the dependent variable. However, because of this, I would not make any inference on individual beta parameter. This means, for example, that I would not discuss what Beta1 represents in terms of how changes in X1 can affect Y holding other independent variables constant. In reality, the factors being studied exist alongside with each other and separating and analyzing each variable independent of others can be unrealistic and counterproductive. In its application to the hospital and community settings, this study must ultimately help create meaningful programs to improve health outcomes related to CHF. Thus, in its practical sense, knowledge and insights obtained from this study are developed to observe the relationship between readmission and all the factors mentioned and not to create programs based on individual factor.

Threats to Validity

External validity refers to the generalizability of the findings to other populations, groups, or context, and the threat to external validity happens when the researcher makes an incorrect inference from the sample data to other persons, groups, or contexts (Creswell, 2009). One type of threat is the interaction of selection and treatment. As mentioned, the racial characteristic of the county that the hospital mainly caters to is lopsided in favor of the White population. In addition, this county consistently ranks as one of the richest counties in the United States. Thus, there can be a narrow characteristics of the participants in terms of race and SES. While it may represent northern Virginia in general, I restricted the claim of the result of my study and specified that it cannot be used to generalize about the Commonwealth of Virginia. In addition, I

would suggest that another study be conducted with different group characteristics and/or with a different area (Creswell, 2009). This also addressed the interaction of setting and treatment as another type of threat to External Validity.

Internal Validity is related to the concern that an empirical relationship exists because of the independent variable and not something else (Polit & Beck, 2012). One type of threat is Selection in which participants can be chosen with certain characteristics that predispose them to have certain outcomes. This doctoral study is a case-control study with strict criteria of participants wherein they must have CHF and must have been hospitalized. From the data of these participants, one group became the case (readmitted within 30-day period from a previous admission) and the other, the control (those who were never readmitted within 30-day period from a previous admission). Another threat is the sample size or the number of participants. As noted above, I performed power analysis prior to the conduct of the study in order to address this threat. Other types of threats to internal validity may not be applicable to this study because of its use of the secondary data. This included History that may be more applicable to experimental studies wherein an event can occur that influences the outcome of the experiment. While an event in the patient's life that can affect his or her readmissions could be a variable, that cannot be controlled by me. Another one is Mortality wherein participants will drop out during the experiment. While mortality may affect the rate of readmission during the period of time that the study covered (2014—2017), this would be beyond the control of this study.

Ethical Procedures

I always maintained patient confidentiality throughout the conduct of the study. I assigned study data records with a unique 6-digit ID randomly generated using a random numbers table in lieu of protected health information (PHI). Furthermore, I reported and shared the data only in aggregate to ensure anonymity. I maintained a separate index database with patient name, MRN, and I assigned unique 6-digit ID. The index was separate from the study data. I stored the data in a password-accessible hospital computer. Access to the database was restricted to me only. The database will be retained for a maximum of three years following study completion per policy.

Lastly, I conducted this doctoral study in accordance with the ethical principles based on the Declaration of Helsinki. It was consistent with standard clinical and academic practices set forth by the hospital and Walden University, respectively, and other applicable laws and regulations. I submitted the study proposal to the applicable ethical review boards at both institutions

Summary

In this section, I discussed the research design, methodology, and threats to validity. This study was a quantitative retrospective case-control study utilizing secondary data of records of CHF patients admitted to a northern Virginia hospital. I started data collection after getting approval from the IRBs of Walden University and the hospital. The dependent variable of this study was CHF readmission as the case and CHF admission as the control. The independent variables were payer status, race, ethnicity, living arrangement, and comorbidities. The covariates in this study were age and sex of

the patients. I conducted descriptive and inferential statistics to establish possible associations between the dependent and independent variables. I used chi-square test of independence to conduct bivariate analysis and I used logistic regression to perform multivariate analysis. I conducted power analysis using the Power 3,G*Power and I used IBM SPSS Statistics 25 to perform the statistical analyses.

I analyzed my research questions together with what is known in the literature and how the results can contribute to positive social change. Since this study took place in northern Virginia that is consistently ranked among the richest counties in the USA, I cannot use this study to generalize about the Commonwealth of Virginia and the country as a whole. Lastly, in the next part of this study, Section 3, I discussed results and findings of this study.

Section 3: Presentation of the Results and Findings

Introduction

I designed this study to test the significant relationship between socioeconomic and health-related factors and 30-day CHF readmissions. Specifically, I attempted to answer the following research questions:

Research Question 1 (RQ1): What is the relationship between 30-day readmission of individuals with CHF and their payer status as measured by type of insurance or its absence?

Null Hypothesis (H_01): There is no relationship between 30-day readmission of individuals with CHF and their payer status as measured by the type of insurance or its absence after adjusting for potential confounders.

Alternative Hypothesis (H_a1): There is a relationship between 30-day readmission of individuals with CHF and their payer status as measured by the type of insurance or its absence after adjusting for potential confounders.

Research Question 2 (RQ2): What is the relationship between 30-day readmission of individuals with CHF and their race?

Null Hypothesis (H_02): There is no relationship between 30-day readmission of individuals with CHF and their race after adjusting for potential confounders.

Alternative Hypothesis (H_a2): There is a relationship between 30-day readmission of individuals with CHF and their race after adjusting for potential confounders.

Research Question 3 (RQ3): What is the relationship between 30-day readmission of individuals with CHF and their ethnicity?

Null Hypothesis (H_03): There is no relationship between 30-day readmission of individuals with CHF and their ethnicity after adjusting for potential confounders.

Alternative Hypothesis (H_a3): There is a relationship between 30-day readmission of individuals with CHF and their ethnicity after adjusting for potential confounders.

Research Question 4 (RQ4): What is the relationship between 30-day readmission of individuals with CHF and their primary spoken language?

Null Hypothesis (H_04): There is no relationship between 30-day readmission of individuals with CHF and their primary spoken language after adjusting for potential confounders.

Alternative Hypothesis (H_a4): There is a relationship between 30-day readmission of individuals with CHF and their primary spoken language after adjusting for potential confounders.

Research Question 5 (RQ5): What is the relationship between 30-day readmission of individuals with CHF and their living arrangement?

Null Hypothesis (H_05): There is no relationship between 30-day readmission of individuals with CHF and their living arrangement after adjusting for potential confounders.

Alternative Hypothesis (H_a5): There is a relationship between 30-day readmission of individuals with CHF and their living arrangement after adjusting for potential confounders.

Research Question 6 (RQ6): What is the relationship between 30-day readmission of individuals with CHF and comorbidities in the dataset as identified in their medical records?

Null Hypothesis (H_0): There is no relationship between 30-day readmission of individuals with CHF and comorbidities in the dataset as identified in their medical records after adjusting for potential confounders.

Alternative Hypothesis (H_a): There is a relationship between 30-day readmission of individuals with CHF and comorbidities in the dataset as identified in their medical records after adjusting for potential confounders.

Research Question 7 (RQ7): What is the relationship between 30-day readmission of individuals with CHF and their payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities in the dataset as identified in their medical record?

Null Hypothesis (H_0): There is no relationship between 30-day readmission of individuals with CHF and their payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities in the dataset as identified in their medical record after adjusting for potential confounders.

Alternative Hypothesis (H_a): There is a relationship between 30-day readmission of individuals with CHF and their payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities in the dataset as identified in their medical record after adjusting for potential confounders.

Data Collection of Secondary Data Set

I obtained secondary data from patients admitted to the hospital from July 2014 to December 2017. I got the list from the Office of Quality, Performance Improvement, and Outcomes. I started conducting chart review December 2019 after my proposal was approved and all necessary protocols and documentation as required by the hospital were met. Initially, based on the information provided by Office of Quality, Performance Improvement, and Outcomes., I planned to use 215 cases (as initially reported by this office) and the rest of the participants as controls to reach a total number of 450 participants. Nevertheless, while reviewing the charts, I realized that there were more than 215 readmitted cases. I therefore made a study amendment to make use of equal number of cases and controls at 225 participants each. This was approved by the hospital's IRB and Walden University's IRB. I finished my data collection in February 2020. I reviewed four hundred and fifty charts. These were charts of patients who met the criteria set forth before the conduct of the study. Moreover, these were the selected charts based on the predetermined sampling process.

Univariate Analysis Results

The final dataset was composed of 450 participants equally divided between case and control groups. Table 1 shows the age distribution of the respondents. I categorized them into three groups in order to analyze age better with clinical point of view application. Age 64 and below is the cohort of Americans who typically work. At age 65, American workers can access Medicare. Age 81 and above was another age group; these

individuals may need more assistance than ever. Most of the respondents belong to age group 81 years of age and above. Moreover, 52% were male and 48% were female.

Table 1 shows the race of the respondents. The majority of the respondents were White at 77.3%. The rest were composed of Black, Asian, and Others, who were either of mixed race or did not identify their racial profile. Almost 93% of the respondents identified themselves as Not Hispanic/Latino while about 5% identified themselves as Hispanic/Latino.

Ninety percent of the respondents identified English as their primary language. The remaining 9.8% spoke Spanish and other languages. For living arrangements, 56.7% of the respondents lived with their family, 18.9% lived alone, 12.2% lived in SNF, and 12% lived in ALF. Lastly, on payer status, about 60% of the respondents were on Medicare plus private insurance (combination). The rest were on Medicare, Medicaid, had private insurance, or were uninsured.

Table 1. Demographics of the Respondents

Variables	Grouping	Frequency	Percent
Age distribution	<64	73	16.22
	65-80	181	40.22
	81+	196	43.55
Sex	Male	234	52
	Female	216	48
Race	White	348	77.3
	Black	44	9.8
	Asian	30	6.7
	Other	28	6.2
Ethnicity	Not Hispanic/Latino	418	92.9
	Hispanic/Latino	23	5.1
	Missing	9	2
Primary Language Spoken	English	406	90.2
	Spanish	19	4.2
	Others	25	5.6
Living	With Family	255	56.8
	ALF*	54	12
Variables	Grouping	Frequency	Percent
	SNF*	55	12.2
	Lives alone	85	18.9
	Missing	1	.2
Payer Status	Medicare	85	18.9
	Medicaid	31	6.9
	Private	55	12.2
	Combination	269	59.8
	Self-pay	10	2.2

Note. ALF = Assisted Living Facility; SNF = Skilled Nursing Facility; $N = 450$.

Table 2 shows the 12 most common comorbidities of individuals with CHF in the dataset as identified from their medical records. HTN was the most common: 80% of the

respondents had it. This was followed by arrhythmia, DM, and CRF. Only 3.1% of the respondents had hepatitis.

Table 2. Comorbidities of the Respondents

Comorbidity	Frequency	Percent
Hypertension	361	80.2
Arrhythmia	232	51.6
Diabetes Mellitus	192	42.7
Chronic Renal Failure	185	41.1
Chronic Obstructive Pulmonary Disease	125	27.8
Myocardial Infarction	111	24.7
Thyroid Disorders	86	19.1
Malignant Neoplasia	84	18.7
Obstructive Sleep Apnea	72	16.0
Major Depression	67	14.9
Cognitive Impairment	28	6.2
Hepatitis	14	3.1

Analyses to Answer the Research Questions

Research Question 1 (RQ1): What is the relationship between 30-day readmission of individuals with CHF and their payer status as measured by type of insurance or its absence?

Null Hypothesis (H_0): There is no relationship between 30-day readmission of individuals with CHF and their payer status after adjusting for age and sex as potential confounders.

Alternative Hypothesis (H_a): There is a relationship between 30-day readmission of individuals with CHF and their payer status after adjusting for age and sex as potential confounders.

Chi-square test of independence shows that $\chi^2 = 10.69$ (df 4, $p = 0.030$) is greater than $\chi^2_{9.49}$ ($\alpha 0.05$, df= 4). Thus, the null hypothesis was rejected. This means that there was a relationship between 30-day readmission and payer status. This further means that there was difference in proportion of readmitted patients among the different payer status.

Table 3 shows that about 67.7 % among the Medicaid respondents experienced readmission compared to only about 33% who did not experience readmission. Interestingly, there were more readmitted (53.2 %) respondents who have a combination of insurance than those who were not readmitted. On other hand, there were fewer readmissions compared to those who were not readmitted among respondents who were on Medicare (38.8 %) and those who carry private insurance (41.8 %). Lastly, the number of those who experienced readmission and those who did not experience readmission among those who did not have insurance were at the same percentage—50% each.

Table 3. Payer Status of the Respondents in Relation to Their Readmission Status

Payer Status	Readmitted		Total
	No	Yes	
Medicare	52 (61.2%)	33 (38.8%)	85
Medicaid	10 (32.3%)	21 (67.7%)	31
Private	32 (58.2%)	23 (41.8%)	55
Combination	126 (46.8%)	143 (53.2%)	269
None	5 (50%)	5 (50%)	10
Total	225 (50%)	225 (50%)	450

Logistic regression shows (Table 4) that the payer status of a patient was a significant factor in CHF readmission ($p = 0.034$). However, each subvariable (Medicare, Medicaid, private insurance, combination of insurance) when treated individually was not significant (all with > 0.05) when compared to having no insurance. However, the equation still shows that individuals on Medicare and on private insurance were less likely to be readmitted when compared to those without insurance. Interestingly, individuals on Medicaid, when compared to individuals without insurance were more likely to be readmitted.

To test for confounders, I ran another logistic regression with age and sex added as potential confounders (Table 4). Age and sex did not remain in the regression model during the stepwise procedure. This means that age and sex were not confounders for payer status.

Table 4. Payer Status in Logistic Regression With and Without Age and Sex As Confounders

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Payer Status			10.436	4	.034			
	Medicare	-.455	.670	.460	1	.498	.635	.171	2.362
	Medicaid	.742	.740	1.005	1	.316	2.100	.492	8.956
	Private	-.330	.689	.230	1	.632	.719	.186	2.774
	Combination	.127	.644	.039	1	.844	1.135	.321	4.011
	Constant	.000	.632	.000	1	1.000	1.000		

Note. Age and Sex were tested as confounders but did not stay in the model. N = 450.

^a Variable(s) entered on step 1: Payer Status.

Research Question 2 (RQ2): What is the relationship between 30-day readmission of individuals with CHF and their race?

Null Hypothesis (H_0): There is no relationship between 30-day readmission of individuals with CHF and their race after adjusting for age and sex as potential confounders.

Alternative Hypothesis (H_{a2}): There is a relationship between 30-day readmission of individuals with CHF and their race after adjusting for age and sex as potential confounders.

Chi-square test of independence shows that the chi-square result ($\chi^2 = 4.081$, $p = 0.253$) is less than $\chi^2 = 7.81$ ($\alpha 0.05$, $df = 3$). Therefore the null hypothesis was accepted. This means that there was no statistically significant relationship between 30-day readmission and race. Table 5 shows the distribution of respondents according to their race and whether or not they were readmitted. It shows that among White respondents, about 49% were readmitted compared to about 64% among Black respondents, and 47% among Asian respondents. Confounders were not tested. This is because the chi-square test result was still lower than the 0.2 p-value threshold for including variables as confounders ($X^2 = 4.64$, $\alpha 0.2$, $df 3$).

Table 5. Race Distribution of the Respondents

Race	Not Readmitted	Readmitted	Total
White	177 (50.9%)	171 (49.1)	348
Black	16 (36.4%)	28 (63.6%)	44
Asian	16 (53.3%)	14 (47.7%)	30
Others	16 (57.1%)	12 (42.9%)	28
Total	225 (50%)	225 (50%)	450

Research Question 3 (RQ3): What is the relationship between 30-day readmission of individuals with CHF and their ethnicity?

Null Hypothesis (H_03): There is no relationship between 30-day readmission of individuals with CHF and their ethnicity after adjusting for age and sex as potential confounders.

Alternative Hypothesis (H_a3): There is a relationship between 30-day readmission of individuals with CHF and their ethnicity after adjusting for age and sex as potential confounders.

Chi-square test of independence shows that the chi-square result (χ^2 1.373, $p = 0.241$) is less than $\chi^2 = 3.84$ (α 0.05, df 1). Therefore the null hypothesis was accepted. This means that there was no statistically significant relationship between 30-day readmission and ethnicity. Table 6 shows the ethnicity of the respondents in relation to whether or not they were readmitted or not. Among the Non-Hispanic respondents, about 52% of them were readmitted as compared to only 39% of the Hispanic respondents. This means that Non-Hispanics were readmitted more than the Hispanics. Nine out of 450 respondents (2%) did not identify their ethnicity and they were all categorized under "Not Readmitted." To test for the potential confounders, I lowered the chi-square p-value threshold of ethnicity from 0.05 to 0.2. Result shows $\chi^2 = 1.64$ ($\alpha = 0.2$, df 1), which is still higher than $\chi^2 = 1.373$ (see above). Therefore, I did not test age and sex as confounders of ethnicity because even at $\alpha = 0.2$, there was still no statistically significant relationship between 30-day readmission and ethnicity.

Table 6. Ethnicity of the Respondents

Ethnicity	Not Readmitted N (%)	Readmitted N (%)	Total N (%)
Not Hispanic	202 (48.33%)	216 (51.67%)	418
Hispanic	14 (60.87%)	9 (39.13)	23
Missing	9 (100%)	0 (0%)	9
Total	225	225	450

Research Question 4 (RQ4): What is the relationship between 30-day readmission of individuals with CHF and their primary spoken language?

Null Hypothesis (H_04): There is no relationship between 30-day readmission of individuals with CHF and their primary spoken language after adjusting for age and sex as potential confounders.

Alternative Hypothesis (H_a4): There is a relationship between 30-day readmission of individuals with CHF and their primary spoken language after adjusting for age and sex as potential confounders.

Chi-square test of independence shows that the chi-square (χ^2 0.834, $p = 0.659$) is less than $\chi^2 = 5.99$ (α 0.05, $df = 2$). Therefore, the null hypothesis was accepted. This means there was no statistically significant relationship between 30-day readmission and primary language spoken. Table 7 shows an equal number of being readmitted/not

readmitted among the English-speaking respondents and there were fewer Spanish-speaking respondents (42%) readmitted compared to their not-readmitted counterparts. Others composed of Farsi, Chinese, Hindi, Vietnamese, Urdu, Russian, Nepal Bhasa and Somali were 2% each or less. To test for the potential confounders, I lowered the chi-square p-value threshold of primary language spoken from 0.05 to 0.2. Results show $\chi^2 = 3.21$ ($\alpha = 0.2$, $df = 2$)—still higher than $\chi^2 = 0.834$ (see above). Therefore, I did not test age and sex as confounders of primary spoken language. Even at $\alpha = 0.2$, there was still no statistically significant relationship between 30-day readmission and primary spoken language.

Table 7. Primary Language Spoken by the Respondents

Primary Language	Not Readmitted N (%)	Readmitted N (%)	Total
English	203 (50%)	203 (50%)	406
Spanish	11 (57.89%)	8 (42.11%)	19
Others	11 (44%)	14 (56%)	25
Total	225	225	450

Research Question 5 (RQ5): What is the relationship between 30-day readmission of individuals with CHF and their living arrangement?

Null Hypothesis (H_0): There is no relationship between 30-day readmission of individuals with CHF and their living arrangement after adjusting age and sex as potential confounders.

Alternative Hypothesis (H_{a5}): There is a relationship between 30-day readmission of individuals with CHF and their living arrangement after adjusting age and sex as potential confounders.

The Chi-square test of independence shows the chi-square (χ^2 77.457, $p < 0.001$) is greater than χ^2 7.81 (α 0.05, $df = 3$): The null hypothesis is rejected. This means that there is a significant relationship between 30-day readmission and living arrangement.

Logistic regression shows (Table 8) that when compared to living alone, patients who live with family and those who live in ALF had lower odds of being readmitted ($p < 0.001$, 95% CI 0.108, 0.320, and $p = 0.036$, 95%CI: 0.226, 0.952, respectively). This means that individuals with CHF were less likely to be readmitted if they live with their family or if they live in ALF than when they live alone. On the other hand, when compared to living alone, the odds of being readmitted if a patient comes from SNF was 2.5 times greater than those who live alone ($p = 0.048$, 95% CI : 1.008, 6.423).

To test for confounders, I ran another logistic regression including age and sex in the equation (Table 8). It showed no change in equation values of living arrangement despite adding age and sex. This means that age and sex were not confounders.

Table 8. Living Arrangement of the Respondents in Logistic Regression Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1 ^a			66.359	3	.000			
Living Arrangement								
Lives with Family	-1.685	.278	36.742	1	.000	.185	.108	.320
Lives in ALF	-.768	.367	4.387	1	.036	.464	.226	.952
Lives in SNF	.934	.473	3.904	1	.048	2.544	1.008	6.423
Constant	.992	.244	16.497	1	.000	2.696		

Note. Age and Sex were tested as confounders but did not stay in the model.

N = 450; ALF = Assisted Living Facility; SNF= Skilled Nursing Facility.

^a Variable(s) entered on step 1: Living Arrangement.

Research Question 6 (RQ6): What is the relationship between 30-day readmission of individuals with CHF and comorbidities in the dataset as identified in their medical records?

Null Hypothesis (H_0): There is no relationship between 30-day readmission of individuals with CHF and comorbidities in the dataset as identified in their medical records after adjusting for age and sex as potential confounders.

Alternative Hypothesis (H_a): There is a relationship between 30-day readmission of individuals with CHF and comorbidities in the dataset as identified in their medical records after adjusting for age and sex as potential confounders.

Chi-square test of independence shows that among the 12 common comorbidities, only CRF has chi-square (χ^2 5.737, $p = 0.017$) greater than χ^2 3.84 ($\alpha = 0.05$, $df = 1$).

Thus the null hypothesis was rejected. This means that CRF has a relationship with 30-day readmission. Moreover the $p = 0.017 < 0.05$, which means that the relationship is statistically significant.

The rest of the comorbidities—namely, arrhythmia, HTN, MI, hepatitis, diabetes mellitus, thyroid disorders, COPD, OSA, malignant neoplasia, major depression, and cognitive impairment—each had a chi-square result less than $\chi^2 3.84$, thus, the null hypothesis was accepted. This means that there is no statistically significant relationship between 30-day readmissions and these comorbidities (Table 9).

Table 9. Chi-Square, Comorbidities

Comorbidity	X ² Value	df	Asymptotic Significance (2-sided p-value)
CRF	5.737	1	.017
Malignant Neoplasia	2.869	1	.090
Hypertension	2.367	1	.124
Arrhythmia	1.744	1	.187
Major Depression	1.420	1	.233
COPD*	1.340	1	.247
Cognitive Impairment	.609	1	.435
OSA*	.595	1	.440
Myocardial Infarction	.299	1	.585
Hepatitis	.295	1	.587
Thyroid Disorders	.058	1	.810
Diabetes Mellitus	.036	1	.849
N of Valid Cases	450		

Note. COPD = Chronic Obstructive Pulmonary Disease; OSA = Obstructive Sleep Apnea.

Logistic regression shows (Table 10) that individuals without CRF were less likely to be readmitted as compared to those who have CRF with odds ratio < 1 (p =

0.017, 95% CI: 0.432, 0.920). Stated differently, individuals with CRF are more likely to be readmitted than those who do not have CRF.

Table 10. CRF in Logistic Regression Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	No CRF	-	.193	5.709	1	.017	.631	.432	.920
		.461							
	Constant	.272	.148	3.358	1	.067	1.313		

^aVariable(s) entered on step 1: CRF.

To test for confounders, I ran another logistic regression including age and sex in the equation. The results showed (Table 11) that the age group 81 and above has minimal negative confounding effect on CRF. Sex, on other hand, did not stay in the final model when the logistic regression was run. This means that sex was not a confounder. Overall, sex and age did not affect the predictive capacity of CRF; that is, with or without these confounders, individuals with CRF still were more likely to be readmitted than those without CRF.

Table 11. CRF With Age and Sex as Confounders in Logistic Regression Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	No CRF	-.461	.193	5.709	1	.017	.631	.432	.920
	Constant	.272	.148	3.358	1	.067	1.313		
Step 2 ^b	No CRF	-.478	.194	6.060	1	.014	.620	.424	.907
	Age > 81	.383	.193	3.960	1	.047	1.467	1.006	2.140

^aVariable(s) entered on step 1: CRF.

^bVariable(s) entered on step 2: Age > 81.

Furthermore, to test for confounders on all comorbidities that passed the 0.2 p-value threshold, I ran another logistic regression with all comorbidities that passed the said p-value threshold—namely, CRF, malignant neoplasia, HTN, and arrhythmia (see Table 13)—first without the confounders and second, with the confounders.

Table 12 shows the select comorbidities without the confounders. At p-value 0.2 threshold, malignant neoplasia was a significant predictor ($p = 0.049$, 95% CI: 0.376, 0.997) together with CRF. Individuals without malignant neoplasia were less likely to be readmitted (odd ratio < 1) from CHF than those who have malignant neoplasia. The other comorbidities that were tested—namely, HTN and arrhythmia—did not show in the equation which means that these comorbidities were not significant predictors of readmission.

Table 12. Select Comorbidities Without Confounders in Logistic Regression Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for	
								EXP(B)	
								Lower	Upper
Step 1 ^a	No CRF	-.461	.193	5.709	1	.017	.631	.432	.920
	Constant	.272	.148	3.358	1	.067	1.313		
Step 2 ^b	No CRF	-.508	.195	6.749	1	.014	.620	.424	.907
	No malignant neoplasia	-.490	.249	3.889	1	.049	.613	.376	.997
	Constant	.698	.264	7.001	1	.008	2.011		

^aVariable(s) entered on step 1: CRF.

^bVariable(s) entered on step 2: Malignant Neoplasia.

Table 13 shows similar tested comorbidities with age and sex added as confounders. The equation showed that age had a negative confounding effect to malignant neoplasia as a predictor. With age in the equation, malignant neoplasia disappeared in the model. Nevertheless, the effect of age on CRF was still insignificant. The odds of being readmitted if one does not have CRF remains less than 1. Sex, however, was not a confounder.

Table 13. Select Comorbidities With Age and Sex as Confounders in Logistic Regression Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for	
								EXP(B)	
								Lower	Upper
Step 1 ^a	No CRF	-.461	.193	5.709	1	.017	.631	.432	.920
	Constant	.272	.148	3.358	1	.067	1.313		
Step 2 ^b	No CRF	-.478	.194	6.060	1	.014	.620	.424	.907
	Age > 81	-.383	.193	3.960	1	.047	.682	.467	.994
	Constant	.498	.188	6.999	1	.008	1.646		

Note. N= 450; Age and Sex were tested but Sex did not show in the model.

^aVariable(s) entered on step 1: CRF.

^bVariable(s) entered on step 2: Age > 81.

Research Question 7 (RQ7): What is the relationship between 30-day readmission of individuals with CHF and their payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities in the dataset as identified in their medical record?

Null Hypothesis (H_07): There is no relationship between 30-day readmission of individuals with CHF and their payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities in the dataset as identified in their medical record after adjusting for age and sex as potential confounders.

Alternative Hypothesis (H_a7): There is a relationship between 30-day readmission of individuals with CHF and their payer status, race, ethnicity, primary language spoken, living arrangement, and comorbidities in the dataset as identified in their medical record after adjusting for age and sex as potential confounders.

The equation shows (Table 14) that among the predictors, living arrangement was the strongest (Step1/Model 1) predictor of readmission. When compared to living alone, patients who live with family and those who live in ALF were significant predictors ($p = 0.00$, 95% CI: 0.108, 0.320, and $p = 0.036$, 95% CI: 0.226, 0.952, respectively). When compared to living alone, patients who live with family and those who live in ALF were less likely to be readmitted (odds ratio < 1). Living in SNF was also significant and showed an odd ratio of 2.5 compared to living alone, which means that those who live in SNF were 2.5 times more likely to be readmitted than those who live alone ($p = 0.048$, 95% C I: 1.008, 6.423).

In Step 2, payer status was added in the equation (Table 14). The result showed no significant effect on living arrangement except on “living on SNF” from being significant (p - value 0.048, CI 1.008, 6.423) to being not significant (p -value 0.056, CI 0.975, 6.405). In addition, payer status remained not significant, all with p -value > 0.05 . With living arrangement in the equation, while the actual values of the odd ratio of payer status dropped, it still showed that the odds of being readmitted among Medicare patients and those with private insurance remained less than 1 compared to those who do not have insurance. Among Medicaid patients, the odds of being readmitted went up from 2.1 to 2.9 when compared to those without insurance. Lastly, for patients who have combination of insurance, the odds of being readmitted went down from 1.3 to less than 1 when compared to those without insurance (compare logistic regression tables of payer status, living arrangement, and CRF with Table 14).

In Step 3 (Model 3), CRF was added as predictor (Table 14). The odds ratio of being readmitted with predictors living arrangement and payer status did not significantly change from Model 2. In addition, the odds ratio of being readmitted when one does not have CRF remains less than 1 when compared to those who have CRF ($p = 0.021$, 95% CI: 0.393, 0.926).

Table 14. Logistic Regression Equation of Significant Variables

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
						.000			
Step 1 ^a	Living arrangement			66.359	3				
	Lives w/ family	-1.685	.278	36.742	1	.000	.185	.108	.320
	Lives in ALF	-.768	.367	4.387	1	.036	.464	.226	.952
	Lives in SNF	.934	.473	3.904	1	.048	2.544	1.008	6.423
	Constant	.992	.244	16.497	1	.000	2.696		
Step 2 ^b	Living arrangement			69.779	3	.000			
	Lives w/ family	-1.823	.287	40.359	1	.000	.162	.092	.283
	Lives in ALF	-.894	.387	5.341	1	.021	.409	.191	.873
	Lives in SNF	.916	.480	3.637	1	.056	2.499	.975	6.405
	Payer Status			15.307	4	.004			
	Medicare	-.796	.731	1.188	1	.276	.451	.108	1.888
	Medicaid	1.096	.799	1.884	1	.170	2.993	.625	14.325
	Private	-.364	.745	.239	1	.625	.695	.161	2.993
	Combination	-.185	.702	.070	1	.792	.831	.210	3.289
	Constant	1.318	.718	3.370	1	.066	3.734		

(continued)

Step		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for	
								EXP(B)	
								Lower	Upper
3 ^c	Living arrangement			69.779	3	.000			
	Lives w/ family	-1.826	.289	39.854	1	.000	.161	.091	.284
	Lives in ALF	-.880	.390	5.098	1	.024	.415	.193	.890
	Lives in SNF	.915	.482	3.605	1	.058	2.496	.971	6.418
	Payer Status			15.085	4	.005			
	Medicare	-.861	.744	1.338	1	.247	.423	.098	1.818
	Medicaid	1.015	.812	1.563	1	.211	2.760	.562	13.560
	Private	-.398	.759	.275	1	.600	.672	.152	2.974
	Combination	-.186	.715	.067	1	.795	.831	.205	3.371
	No CRF	-.505	.219	5.333	1	.021	.604	.393	.926
	Constant	1.636	.746	4.808	1	.028	5.135		

Note. N= 450.

^a Variable(s) entered on step 1: Living Arrangement.

^b Variable(s) entered on step 2: Payer Status.

^c Variable(s) entered on step 3: CRF.

To test for potential confounders, I ran another logistic regression test including age and sex as potential confounders (Table 15). Results showed that age and sex were not significant contributors at the $\alpha = 0.2$ level to the model and therefore were not considered confounders.

Table 15. Logistic Regression Equation of Significant Variables With Confounders

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for	
								EXP(B)	
		Lower	Upper						
Step 1 ^a	Living arrangement			66.292	3	.000			
	Lives w/ family	-1.885	.295	40.761	1	.000	.152	.085	.271
	Lives in ALF	-.982	.401	5.989	1	.014	.374	.170	.822
	Lives in SNF	.839	.486	2.986	1	.084	2.314	.893	5.994
	Payer status			13.311	4	.010			
	Medicare	-.959	.779	1.516	1	.218	.383	.083	1.763
	Medicaid	.857	.834	1.055	1	.304	2.355	.459	12.079
	Private	-.410	.765	.287	1	.592	.664	.148	2.972
	Combination	-.396	.767	.266	1	.606	.673	.150	3.026
	No CRF	.125	.055	5.190	1	.023	1.133	1.018	1.262
	Sex	-.191	.219	.763	1	.382	.826	.537	1.269
	Age < 64	-.046	.396	.013	1	.908	.955	.440	2.075
	Age > 81	.314	.251	1.565	1	.211	1.369	.837	2.240
	Constant	1.307	.809	2.610	1	.106	3.693		

Note. N= 450.

^a Variable(s) entered on step 1: Living Arrangement, Payer Status, CRF, Sex. Age < 64, Age > 81.

Summary

The objective of this quantitative study was to analyze the socioeconomic and health-related factors affecting CHF readmissions. The independent variables were payer status, race, ethnicity, primary language spoken, living arrangement, and the 12 most common comorbidities among CHF patients as identified in the literature. The sample population consisted of individuals who were admitted to a particular hospital in northern Virginia and who met the criteria set forth before the start of the study.

I used univariate, bivariate, and logistic regression analyses to answer the research questions. Chi-square test of independence showed that there was a statistically significant relationship between 30-day CHF readmissions and living arrangement, payer status, and chronic renal failure. Logistic regression analysis showed that the patient's living arrangement was the strongest predictor followed by payer status and CRF. At 95% CI, the odds of being readmitted using living arrangement and CRF as predictors were significant. Lastly, this study showed that age and sex are not significant confounders of these relationships.

The next section dealt with Application to Professional Practice and Implications for Social Change. In this section, I interpreted the findings of my study and compared and contrasted these findings with the current literature. I also tried to relate my study to the theory that I used. I discussed the application of my study to research and practice and its limitation. Lastly, I analyzed the impact of my study to positive social change.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The purpose of this study was to analyze the socioeconomic and health-related factors that affect CHF readmission. In particular, I examined the relationship between 30-day CHF readmissions and the patient's payer status, living arrangement, race, ethnicity, and the 12 most common comorbidities as identified from literature. I developed this study in response to the issue of CHF readmission—a problem that is both medical and public health in nature and an issue that is both health and economic-related. Results of the study showed that living arrangement and CRF were the significant predictors of CHF readmissions with living arrangement as the stronger predictor between the two.

Interpretation of the Findings

The study results showed that the patient's type of living arrangement was the strongest predictor of 30-day CHF readmission among the independent variables tested. When compared to living alone, patients who live with family members (OR: 0.2, 95% CI: 0.108, 0.320) and those who live in ALF (OR: 0.5, 95% CI: 0.226, 0.952) have lower odds of being readmitted. One commonality of these types of living arrangement is that at least one other person is with the individual. My study confirms one of the themes that emerged from Rubin et al. (2014) and Regenstein and Andres's (2014) work on the factors that affect readmission among persons with DM and among Medicaid patients, respectively. These studies showed that problems with social support were significant

contributory factor in readmissions. While Rubin et al. conducted a qualitative study, my study showed quantitatively the significance of social support in the form of living with family members or in ALF. Unlike Regenstein and Andres that focused only among Medicaid patients, however, I considered other methods of payment or insurance. Thus, my study provided evidence of the necessity of social support in preventing readmission across all insurance/payer status groups and consequently, across all socioeconomic status.

In addition, my study expanded and quantified the knowledge from the qualitative study by Enguidanos et al. (2015) who studied seriously ill veterans. Their study showed that one reason of readmission among these seriously ill veterans was lack of caregiver support. While their study was conducted among all-male participants, my study included both sexes and had an almost equal ratio of men and women, thus, making my study more sex-inclusive. Davisson and Swanson (2018) conducted a similar qualitative study on patient and nurse experiences in a rural disease management in a rural Midwest county. The authors found that some of the themes that emerged in this qualitative study included peer support and family/friend involvement as significant in disease management (Davisson & Swanson, 2018). This doctoral study confirmed these findings.

Similarly, Lee et al. (2018) did a study on the patterns of self-care and clinical events of adults with heart failure showed that self-care is significantly associated with clinical event thus, necessitating interventions that target self-care to reduce clinical events like shortness of breath among CHF patients. While I did not focus on self-care activities among CHF patients in my study, it is interesting to note that the presence and

therefore assistance of family members and other caregivers would greatly impact the performance of self-care activities. As noted from one of the themes that emerged in a qualitative study on the contributory factors on early readmission, “not having someone to help out” was a factor in a person’s ability to comply discharge plan including self-care activities (Rubin et al., 2014, p. 872).

Secondly, my study showed that CRF was also a significant predictor of readmission among the 12 common comorbidities found in patients with CHF that I analyzed. CHF patients without CRF have lower odds of being readmitted as compared to those who have the actual CRF (OR 0.6, 95% CI: 0.432, 0.920). This is corroborated by Castillo et al. (2017) on the characteristics of patients with CHF within 30 days following acute exacerbation. They found that patients had significant comorbidities and appear to have typical profile; in particular, CHF patients have fluid overload. Most of these individuals with CRF require dialysis on regular basis (Capriotti & Frizzell, 2020). Without dialysis, these individuals would develop fluid overload, exacerbating CHF signs and symptoms (Hinkle & Cheever, 2018). With fluid overload, shortness of breath develops and this this would prompt the individual to seek hospital admission.

Thirdly, this study found that the relationship between payer status and readmission was not statistically significant. Previous researchers such as Regenstien and Andres (2014) only mentioned the readmission rates, saying that Medicaid readmission rate was comparable with or substantially higher than Medicare. However, their studies were not exclusively for CHF patients nor did they compare readmission to admission, like what I did in my study.

Although the differences were not statistically significant, the effect sizes of the odds ratios among payer status suggest that further study is warranted. In this study, I showed that Medicare patients and those on private insurance might have lower odds of being readmitted as compared to those without insurance (OR: 0.6, and 0.7, respectively). In addition, I showed that Medicaid patients might have higher odds of being readmitted than those who do not have insurance (OR 2.1).

Among uninsured individuals, prescription medication costs have been found to be the main burden in their disease management (Shepherd et al., 2014). Through the assistance of the hospital case manager, individuals needing prescriptions may be able to acquire a 30-day supply either totally free or at highly discounted price through coupons. In other words, the availability of medication management assistance might have an effect on 30-day readmissions. Unfortunately, in my study, I utilized data wherein the number of participants on Medicaid and self-pay (no insurance) only constituted 6.9% and 2.2%, respectively, of the total payer status percentage (see Table 1). Thus, I highly suggest a study with more equal distribution of participants by payer status is for future undertaking.

Fourthly, I found in my study that race and ethnicity have no significant relationship with readmission. This is in consonance to the study conducted by Saito et al. (2016) who concluded that among older U.S. veterans admitted due to CHF, Whites and Blacks had similar all-cause readmission rate and Black race was not a significant factor in readmissions. This is also similar to the conclusion of the study conducted by Qian et al. (2015) on racial differences in CHF outcome. The authors said that Blacks were not

disadvantaged when compared to Whites on health status after CHF hospitalization (Qian et al., 2015). While their study did not directly focus on CHF readmissions, the fact they focused on health status *after* hospitalization was indirectly related to the focus of my study. This is because negative health status of a patient after hospitalization is the main reason for him/her to seek hospital readmission. However, my study contradicted the findings on the risk factors for 30-day readmission of patients with CHF in Pennsylvania in which the authors concluded that, among others, Black race is associated with increased risk of readmission (Mirkin et al., 2017).

In summary, while race and ethnicity have roles to play in readmission, my study shows that readmission is an interplay of many factors in which race and ethnicity can be part of these factors. However, taken singly, race and ethnicity are not significant predictors of readmission.

Lastly, primary language spoken was not a significant predictor of readmission. Literature shows that the difficulty of speaking English can negatively affect job prospects with better paying opportunities. The study of Olney (2017) on labor market performance and English proficiency showed that people who spoke a language other than English at home were less likely to be employed, and less likely to find a full-time job and have lower median earnings than those who spoke English at home (Olney, 2017). Other than the economics behind English language proficiency, individuals who do not speak and understand English properly may have trouble understanding the discharge instructions mostly written in English. This in turn, can negatively affect their illness prevention and health promotion activities at home leading to possible

readmission. However, my study failed to show a significant relationship between primary language spoken and readmission. Unfortunately, there is not much literature found to directly compare and contrast my study.

My study also tested age and sex as confounders. These two variables were not significant confounders. Arslanian-Engoren et al. (2018) conducted a similar study on gender and racial differences in surgical outcomes among adult patients with acute heart failure. While their study was focused on surgical outcome of patients with CHF, one of their conclusions was that there was no gender difference in mortality. Their definition of gender was similar to my definition of sex (M/F). However, the result of my study was different from the conclusion of the study conducted by Aggarwal & Gupta (2014). They studied the demographic parameters related to 30-day readmission of patients with CHF by analyzing 2,536,439 hospitalizations. They concluded that young people and males among others have higher readmission from CHF as primary diagnosis than the other groups compared while being female and elderly patients had higher readmission with non-CHF as primary diagnoses. Their study however, only focused on readmission while my study compared readmission as case and admitted but not readmitted as the control. In the context of comparing CHF readmissions from those who were admitted but did not experience readmission, my study did not find age and sex as confounders.

Study Findings and the Theoretical Framework

One of the assumptions of social ecological model is that health and wellbeing of an individual is the result of the interplay among environmental and personal factors rather than from individual analysis of each factor (Glanz et al., 2008; Stokols, 1992,

1996). Result of this study showed that living arrangement and comorbidity of CRF are predictors of CHF readmissions. When these predictors were combined, their significance further improved. According to this theory, these factors are interrelated and therefore better understood if analyzed as group rather than individually.

Another assumption of the theory is related to the multidimensional and complex nature of the environment that should be considered in analyzing the health condition of a person (Glanz et al., 2008; Stokols, 1992, 1996). Thus, the living arrangement was analyzed in this study and was found to be the strongest predictor of readmission. Individuals around the person—family members or caregivers or both—can greatly influence the health promotion and illness prevention activities of the concerned individual, like medication compliance, potentially resulting in fewer readmissions.

The third assumption of this theory is that the effectiveness of health promotion endeavors can be improved significantly by the coordination of the individual himself and family members and healthcare workers, among others (Glanz et al., 2008; Stokols, 1992, 1996). When compared to living alone, individuals who live with family members and those who live in the ALF were less likely to be readmitted. However, in this doctoral study, I failed to show that individuals who live in the skilled nursing facilities were of the same readmission pattern as those who live in ALF who have healthcare workers helping them. In fact, the opposite was found: Individuals who live in SNF have twice the odds of being readmitted compared to those who live alone. There may be other factors unique among SNF residents that make them more prone to readmission that were outside the scope of this study. For example, SNF residents when compared to the

general population, are basically more dependent on caregivers like nurses, certified nursing assistants, and other support groups to meet their daily needs. These SNF residents are individuals who could no longer live independently at home or are unable to be taken care of by family members due to complexity of their needs. With physical and/or mental slowing or deterioration comes the possible complications or effect like fall and even medical conditions like pneumonia, urinary tract infections, skin breakdown among others.

The fourth and the last assumption is related to the transaction between the individual and the environment in a cycle of mutual influence. In this context, distant environment includes community resources as well as state or federal laws and funding. This is where I fitted in the payer status to the equation and in this study, I attempted to look into the relationship of the payer status of the participants and readmission. While in this study, I did not find a statistically significant relationship between payer status and readmission, the result suggested a relationship between the two variables. It showed that Medicare patients and those who have private insurance might be less likely to be readmitted than those who do not have insurance. This highlights the role of the government in protecting the universal right of every individual to health by regulating health insurance and other government-related health, social services, and economic programs. As mentioned, however, since in this study, I failed to establish a statistically significant relationship between payer status and readmission, there is a need to conduct more studies about these variables.

Limitation of the Study

This doctoral research was a case-control study on the socioeconomic and health-related factors affecting CHF readmissions with data of patients who experienced being readmitted within 30-day after their initial discharge as the case group. The control group was from the data of patients who did not experience being readmitted within 30-days after admission. The Office of the Quality of the hospital provided the secondary data that I used in this study. Thus, these patients' data have been properly coded as required by law. This makes these data reliable, trustworthy and valid. However, there are some limitations of the study.

Firstly, the base hospital is located and caters mostly to residents of a county that is consistently ranked as one of the top two richest counties in the United States. While this study included all payer status, among others, it cannot be used to generalize the population of the Commonwealth of Virginia. Secondly, I used data of individuals admitted only from July 2014 to December 2017 time period. Thus, it cannot be used to generalize readmissions from other time periods. Thirdly, majority of the participants belong to one single racial group. Thus, the results cannot be used to generalize the individuals of all racial backgrounds.

Another limitation of this study is related to the inherent limitation of analyzing secondary data. Unfortunately, the data set can be deficient in some ways resulting to “if only” issue—if only the person documenting the needed variables had measured or documented it differently (Polit & Beck, 2012). For example, on the question of the primary language spoken, it was not clear whether or not the hospital registrar who

documented this kind of demographics was specific about the main language spoken by patient at home or he/she simply asked the language spoken by the patient. Another limitation pertained to race. Individuals of middle eastern and north African descent are categorized as White per the CDC. This was not clear whether this was communicated to the patient and family member or they were simply asked their race and may have answered “Asian” if they were of middle eastern descent. In addition, the hospital registrar documented some demographic data as claimed by patient or family member. For example, on the patient’s address and living arrangement, hospital staff relied on what the patient said. It was next to impossible to totally verify the data for completeness and absolute correctness.

Recommendations

I recommend that another study be conducted with a greater number of and/or with a wider scope of study population to include more hospitals within the Commonwealth of Virginia to create a better generalizability. In addition, since this study showed that living arrangement is a significant predictor, future researchers should further explore these subvariables. Likewise, a qualitative study on the lived experiences of individuals with CHF who are frequently readmitted and who live alone would definitely give us a better understanding on why they are frequently readmitted. Lastly, since this study showed that residents of skilled nursing facilities are more likely to be readmitted than those who live alone, further studies need to be undertaken on skilled nursing facilities and readmissions.

The results of this study can be applied to professional practice both in acute setting and more importantly, in community or public health setting. In reality, CHF readmission is best addressed by collaborative work of acute care and public health. In order to break the cycle of admission, discharge, and readmission, these two groups of healthcare institutions must complement each other. Acute care must deal with the patient while he/she is in the hospital making sure that he/she is stabilized and that the discharge instructions are provided in a clear and concise manner. Upon discharge to the community, public health must take charge and focus on health promotion and exacerbation-prevention as well as following up the discharge plan provided by the hospital. Therefore, I recommend that there should be a form of report-sharing between the discharging hospital and the local public health office upon patient discharge. In similar fashion, the admitting hospital must also inquire from the local public health department about patient's activities related to CHF within 24—48 hours after a patient is readmitted.

In public health, preventing readmissions from certain chronic diseases like CHF should be included in its mandate. Thus, there should be a creation of new department or reorganization of existing departments to cater to the needs of frequently readmitted patients. To be more realistic, I further suggest that acute care facilities and public health must create a form of partnership and share resources. For patients discharged to home with family members, to ALF, and to SNF, caregivers should be included in the discharge planning. Subsequent follow-up—either home visit or phone call—must be instituted by a public health worker. For patients who live alone, there must be a follow-

up phone call and a home visit also from the public health department. Moreover, a follow-up phone call must be done close to the scheduled appointment in order to ensure compliance. In other words, any patient who is found to be living alone and found to be frequently readmitted must have a form of assistance from the public health office especially those who do not qualify for home health visitation. This includes but is not limited to independent or “self-care” individuals.

In this study, I found out that living arrangement was the strongest predictor of readmission. Individuals who live with family members and those who live in ALF were found to be less likely readmitted than those who live alone. While it is important to focus on those individuals who live alone, the result of this doctoral study also shows the need to enhance the skills of family members and treat them as partners in preventing readmission. Therefore, I recommend that discharging hospital facilities must include family members when discussing discharge plan. Moreover, I also recommend to include a plan or program wherein the public health office must be made aware of the discharge and have a copy of the discharge plan. In turn, a public health nurse must conduct a follow-up call or a visit one or two days after discharge and to endeavor to meet the patient and his or her family in the latter’s home. This is an excellent way of assessing further the health need of the patient at home.

Lastly, results of this study can be used partly or wholly to create a program—either as public health-based or a partnership between public health and hospital—geared towards prevention of readmissions. This program or programs when planned must be collaboratively created with all possible stakeholders (or their

representatives). These programs must be available, affordable, accessible, and acceptable to the intended recipients.

Positive Social Change

In essence this study was focused on the individual, the family, and the community. These interrelated stakeholders are equally important to focus on in order to create a just, livable, and humane society. This type of society is itself the ultimate goal of positive social change. This study showed that living arrangement is a predictor of readmission—that is, individuals who live alone are more likely to be readmitted than those who live with their family and those who live in ALF. Thus, it is very important to consider a form of assistance among those who live alone. Public health and acute care stakeholders must therefore focus on these individuals with each of the two having distinct roles. The former must focus on health promotion and exacerbation prevention while the later must focus on acute treatment of illness exacerbation while sharing unique yet complementary expertise and resources. These individuals may be independent and therefore do not qualify to receive an assistance from the government and thus, more likely neglected. Usually, these are individuals who are not too sick or too dependent on others for ADLs to go to nursing homes but sick enough that they are unable to perform meaningful health promotion activities like getting prescriptions, exercise, timely appointments, among others. With interventions like home visit programs, these individuals can be assisted in meal planning, picking up prescriptions, making medical appointments and making sure that these individuals would actually go to the needed appointment among others. Thus, in the end, if these individuals are assisted, they will be

less likely to be readmitted due to illness exacerbation and therefore will be more likely to experience a higher quality life. This is itself a tangible description of positive social change.

Conclusion

In this study, I analyzed the socioeconomic and health-related factors that affect CHF readmissions. I found that living arrangement was the strongest predictor of readmission. Individuals who live with family members and those who live in ALF have lower odds of being readmitted than those who live alone. In addition, I also found that CRF was a significant comorbidity predictor of readmission among the twelve most common comorbidities of patients with CHF. Individuals with CRF have higher odds of being readmitted than those who do not have CRF. Moreover, there is also a suggestion of a relationship between payer status and readmission. While it is not statistically significant, patients on Medicare and those who have private insurance might have lower odds of being readmitted than those who do not have insurance. Nevertheless, in this study, I also showed that Medicaid patients might have higher odds of being readmitted compared to those who do not have insurance. Lastly, I did not find age and sex as confounders for the significant predictors of CHF readmission. In summary, the main socioeconomic predictor is type of living arrangement and CRF is the health-related predictor of CHF readmissions. Both acute care and public health institutions must collaborate together to create lasting and sustainable positive social change.

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