2-9-2024

Impact of Case Management Models on Congestive Heart Failure Patients' Length of Stay and Readmissions

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This is to certify that the doctoral study by

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Walden University
2024

Abstract

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MSW, University of Central Florida, 2019

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Healthcare Administration

Walden University

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Abstract

Length of stay (LOS) and readmissions are two metrics that are often at the center of improvement efforts for health care systems. There is a lack of evidence regarding the optimal case management model needed to reduce LOS and readmissions for coronary heart failure (CHF) patients. One initiative that has become nationally recognized as a method to improve LOS and readmissions is effective discharge planning. Discharge planning is conducted by case managers whose primary role is navigating patients' complex social, physical, and psychological issues. The purpose of this quantitative study focused on CHF patients and compared two case management models and their effect on LOS and readmissions. The research questions aimed at determining an association between LOS and readmission rates between case management models 1 and 2 for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022. Utilizing a sample size of n = 1,780 and guided by the Donabedian model as the theoretical framework, *t*-test, general linear model, chi-square, and logistic regression analyses revealed no significant differences between case management model utilization and LOS and readmission rates. There was also no significant difference when considering the confounding variables of age and gender. The study contributes to positive social change by providing additional information to health care administrators about different case management models and their impact on LOS and readmission rates for CHF patients.

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Dedication

This dissertation is dedicated to my dad, William Gregory Camp, who is looking down at me from Heaven and my mom, Sharon Suzanne Camp. Through all my schooling, no matter how busy they were, my parents always made time to help me. From editing my papers to encouraging me to never give up, they were the best support system. I aspire to provide my children with the same unconditional love and support my parents gave me. Thank you for raising me to be the person I am today. I love you both so much.

Acknowledgments

I want to thank everyone who has supported me throughout this journey. It truly takes a village, and without the love and support of my family, friends, and mentors, I would have never been able to complete my doctoral journey. First, I must thank my husband, Matt, who has supported me throughout my schooling. He has been with me through my bachelor's, master's, and now my doctoral degree. My husband has shown me what true love and support really is, and I could not have done this without him. I also want to acknowledge my twins, Ryan and Ryleigh, who may not realize I had to do schoolwork, but I know they will be proud of me one day. To my three brothers, Ben, Brent, and Jake, I want to thank you all for being my support system, especially when our dad passed away. And to my best friend, McKenzie, who was always there to relieve stress by cooking us dinner and taking care of the twins when I needed it most.

I would like to acknowledge my Walden team of professors and staff who helped me obtain my doctoral degree. Specifically, I would like to share my sincere appreciation and gratitude for my chair, Dr. Robert Hijazi, and committee member, Dr. Matt Frederiksen-England. I could not have done it without your advice, support, and guidance throughout the doctoral process. Lastly, I want to thank my mentor, Kristine Jordan, who encouraged me to pursue my doctoral degree and was there every step of the way. I could not have done it without you all. Thank you.

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Section 1: Foundation of the Study and Literature Review

Lenth of stay (LOS) for admitted patients and readmissions are two metrics measured by hospitals and are often at the center of improvement efforts given that poor performance contributes to excess costs (Rachoin et al., 2020). One of the key duties of hospital case management is discharge planning, which when done effectively can decrease both LOS and hospital readmissions (Hunt-O'Connor et al., 2021). Health care administrators must understand how different case management models impact LOS and readmission rates. In the current study, I used secondary data to examine two case management models' effects on LOS and readmission rates for patients diagnosed with congestive heart failure (CHF). CHF was selected for this study because patients with CHF are frequently admitted, can be challenging to discharge, and often have extended LOS and a high propensity for readmissions (Hill, 2019; Hunt-O'Connor et al., 2021). The information gained from this study could be used by health care administrators to implement an optimal case management model that assists in the reduction of hospital LOS and readmissions. Taking the necessary steps to reduce LOS and readmissions is known to decrease health care costs and significantly improve patient outcomes, thereby contributing to positive social change (Urbich et al., 2020).

Section 1 consists of background information, the research problem, the purpose of the study, the research questions (RQs) and hypotheses, the theoretical foundation, the nature of the study, and a review of relevant literature. Section 1 also includes the assumptions, scope, delimitations, limitations, and significance of the study.

Background

Case management is becoming nationally recognized as a method to improve health outcomes for patients with complex and chronic illnesses (Harris & Popejoy, 2019). Harris and Popejoy (2019) described the primary role of a case manager as a person who navigates patients' complex social, physical, and/or psychological problems. This specialized department of health care professionals not only supports patients and their families through the complex health care system, but also assists physicians in the expeditious and safe management of hospitalized patients. There has been an increased burden on health care organizations to organize care due to lack of family support (Harris & Popejoy, 2019) and an undeniable need to gain efficiency and lower costs within the health care sector (Hunt-O'Connor et al., 2021).

Case management has been increasingly used in hospital systems due to the surge of chronic diseases and the aging population (Harris & Popejoy, 2019). CHF is one of the most prevalent chronic diseases in the United States and is the leading cause of hospitalizations in the United States (Madanat et al., 2021; Zilberberg et al., 2023). CHF affects over 6 million people, specifically those who are 65 and older (Cleveland Clinic, 2023). The United States has nearly 1 million emergency department (ED) visits each year due to CHF, and over 80% of those ED visits result in hospital admission (Sax et al., 2022). The American Heart Association estimated that by the year 2030, CHF will affect over 8 million people, increasing inpatient hospital admissions to an estimated 700,000 per year (Madanat et al., 2021).

Not only is CHF the leading cause of inpatient hospital admissions, but it is also the most common cause of hospital readmissions (Madanat et al., 2021). Centers for Medicare & Medicaid Services (CMS, 2022) defined hospital readmission as an unplanned admission to an acute care hospital within 30 days of a previous hospital admission and may occur at the same hospital or another acute care hospital. Hospital readmissions are often preventable and significantly contribute to skyrocketing costs, accounting for over $50 billion in 2018 (Beauvais et al., 2022) and are estimated to increase to almost $70 billion by 2030 (Madanat et al., 2021). J. Patel (2021) found the average cost per CHF readmission is approximately $15,000 to $25,000.

With increased hospital admissions and readmissions, CHF also causes prolonged length of hospitalizations, averaging around 7–21 days. With the increased LOS, CHF admissions are linked to poor clinical outcomes and increased use of health care resources (Tigabe Tekle et al., 2022). Substantial research has been conducted related to the increasing burdens of CHF and case management, but it is unclear how one affects the other. There was a clear gap in literature regarding the optimal case management model to reduce LOS and readmissions.

Problem Statement

There is a lack of evidence regarding the optimal case management model needed to reduce LOS and readmissions for CHF patients (Harris & Popejoy, 2019). LOS and readmissions are a focus for health care systems because they are commonly used as performance metrics. Performance metrics are determined by CMS and are directly related to hospital reimbursements (Rachoin et al., 2020). If a hospital system has higher

than normal LOS and readmissions, they could suffer financial penalties. Due to the significant risk of decreased reimbursement, hospital systems must find the case management model that can best assist in the reduction of LOS and readmissions.

Longer hospital stays are a top concern for health care systems because they can have a negative impact on patients. The longer a patient is in the hospital, the more likely they are to contract a hospital-acquired complication such as infections or falls, resulting in an even longer LOS (Ward & V. Patel, 2021). In 2021, there were over 34 million hospital admissions in the United States (American Hospital Association, 2023) that had an average LOS of 5.9 days (OECD Data, 2023). Research found a substantial increase in LOS when there is a breakdown in the discharge planning process due to complexity of discharge needs. Specifically, the evidence showed 1 in 5 patients have delayed discharges due to nonmedical reasons (Hunt-O'Connor et al., 2021) Nonmedical delays include complex social needs, placement complications, and insurance approval for the next level of care (Hunt-O'Connor et al., 2021). Hunt-O'Connor et al. (2021) also mentioned age and comorbidities as potential barriers in the discharge planning process.

Case managers work with physicians, patients, and their families to secure proper resources needed for self-care at home, post acute placement when home discharge is not an option, and the navigation of other complex community and social issues. Poorly executed discharge planning has been found to increase LOS in hospitals for older adults with comorbidities such as CHF (Hunt-O'Connor et al., 2021). If LOS is increased due to discharge delays, hospital systems and patients could have significant adverse consequences. There was a clear gap in the literature regarding the optimal case

management model needed to streamline the discharge planning process, which warranted the need for the current study.

Purpose of the Study

The purpose of this quantitative study was to determine whether there is an association between case management model utilization and hospital LOS and hospital 30-day readmission rates for adult CHF patients in Southwest Florida between 2020 and 2022. The study's dependent variables were hospital LOS and CHF hospital readmission rates. The study's independent variable was the case management model (Case Management Model 1 and Case Management Model 2). Both case management models were identically implemented at the nonprofit, two-hospital health care system in Florida, which encompasses about 700 total inpatient beds. The primary difference between the case management models is the educational degrees of each team member. Case Management Model 1 consists of a master's level social worker (MSW) and discharge planning assistant (DPA). The MSW has a master's degree in social work from an accredited university, and the DPA is required to have a high school diploma or GED. Case Management Model 2 consists of an MSW, DPA, RN, and a care coordinator (CC). The qualifications for an MSW and DPA are the same for both Case Management Model 1 and Case Management Model 2. The RN must be licensed in the state of Florida, have an associate's degree in nursing with a bachelor's degree in a related field, or have a bachelor's degree in nursing. The CC must have a bachelor's degree in social work or a related field. Case Management Model 1 was implemented from August 2020 through

August 2021, and Case Management Model 2 was implemented from September 2021 through August 2022.

There was no delay between the two case management models due to interdepartmental restructuring. For example, DPAs with a bachelor's degree and multiple years of case management experience were promoted to the CC position and placed on floors with experienced MSWs. RNs with prior case management experience transitioned from another part of the revenue cycle, called utilization review, and partnered with experienced MSWs. DPA positions were easily filled by other hospital staff, such as unit secretaries, who already had knowledge of case management and completed similar tasks as unit secretaries, so training was minimal.

Research Question and Hypotheses

The study's RQs and hypotheses are as follows:

RQ1: Is there an association between length of stay and case management model 1 and case management model 2 for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022?

H_o1: Case management model 1 and case management model 2 are not associated with differing length of stay for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a1: Case management model 1 and case management model 2 are associated with differing length of stay for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

RQ2: Is there a difference in the effect of case management models on length of stay based on age and gender for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022?

H_o2_1: The relationship between case management models and LOS is consistent across the different ages for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a2_1: The relationship between case management models and LOS differs across the different ages for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_o2_2: The relationship between case management models and LOS is consistent across gender groups for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a2_2: The relationship between case management models and LOS differs across the gender groups for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

RQ3: Is there an association between readmission rates and case management model 1 and case management model 2 for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022?

H_o3: Case management model 1 and case management model 2 are not associated with differing readmission rates for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a3: Case management model 1 and case management model 2 are associated with differing readmission rates for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

RQ4: Is there a difference in the effect of case management models on readmission rates based on age and gender for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022?

H_o4_1: The relationship between case management models and readmission rates is consistent across the different ages for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a4_1: The relationship between case management models and readmission rates differs across the different ages for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_o4_2: The relationship between case management models and readmission rates is consistent across gender groups for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a4_2: The relationship between case management models and readmission rates differs across the gender groups for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

Theoretical Foundation of the Study

Donabedian (1968) sought to evaluate the quality of medical care, and the Donabedian model of quality care provided the theoretical framework for the current study. The Donabedian model illustrates how structure and process(s) result in outcomes.

The approach is the assessment of the structure, which directly affects the outcomes (Donabedian, 2005). I used one independent variable, the case management model, which was a significant component of the case management structure at a Southwest Florida health care system. Case Management Model 1 consists of MSWs and DPAs, and Case Management Model 2 consists of MSWs, DPAs, RNs, and CCs. Following the Donabedian model, I evaluated whether changing the structure of the case management model had an impact on outcomes such as LOS and readmissions.

Most research has indicated that case managers are often nurses and social workers, but organizations could structure their team to include other related health professionals (Giardino & De Jesus, 2023). Due to the difficulty in hiring qualified MSW case managers, this Florida health care system restructured their case management team to include other health professionals such as CCs. The results of the current study may show the optimal structure for a case management model that is needed to positively impact outcomes such as LOS and readmissions. The Donabedian (2005) theoretical framework provides a direct path to health care quality improvement and was an ideal theory to serve as the current study's foundation.

Nature of the Study

The nature of this study consisted of a quantitative approach using secondary data from a health system in Southwest Florida. To determine how selection of a case management model impacts LOS and readmissions, I used secondary data from patients admitted to the two-hospital system with a diagnosis of CHF. The first case management model was implemented from August 2020 to August 2021, and the second case

management model was implemented from September 2021 to August 2022. The main difference in the models was the disciplines that comprised the case management teams. The two dependent variables were LOS and readmissions, and the one independent variable was the case management models that were identically implemented in the health care system in Southwest, Florida.

Various statistical methods could have been used to compare LOS (continuous variable), readmissions (binary variable), and the case management model (binary variable). There were three methods that could be used to compare these variables: bivariate statistical tests, regression models, and survival analyses. I chose nonparametric tests. There are many benefits of nonparametric tests, such as they make fewer assumptions about the data, sample sizes can be small, they are useful with categories, they have simpler calculations, and they are easier to interpret (Chazard et al., 2017).

Secondary Data Types and Sources of Information

The secondary data collection involved accessing electronic medical records from a Florida health care system to obtain CHF LOS and readmission data for August 2020 to August 2022. This health care system consists of two community-based hospitals in Southwest Florida that comprise approximately 700 licensed beds (NCH Healthcare System, 2023). The Southwest Florida population significantly increases during the winter, contributing to a high hospital census during these months (10 Surprising Statistics on Snowbirds in Florida for 2023, 2023). The current study focused on adults with CHF who were admitted to either of the two hospitals during the time frame of the

two case management models. The case management models were identically implemented at both hospitals.

The secondary data from the Southwest Florida health care system included the following elements: diagnosis-related group (DRG), primary admitting diagnosis, month and year patient was admitted, patient's LOS during the admission, age, gender, discharge disposition, and whether the patient readmitted within 30 days of discharge (NCH Revenue Cycle, 2023). An in-depth proposal was submitted to the health care system's institutional review board (IRB), which included a detailed explanation of the study as well as a request for waiver of consent. The IRB approved the proposal and waiver due to the study being a quantitative, comparative analysis of de-identified, retrospective data. Once approval was obtained from the health care system's IRB, the revenue cycle department assisted me by providing the data needed for the study. The data were de-identified using the expert determination method. This method provides minimal risk that information provided could be used to identify participants in the study (U.S. Department of Health and Human Services, 2022).

Literature Search Strategy

To better understand different case management models and the impact they have on CHF hospital readmissions, I examined multiple databases and websites and retrieved the most recent literature. The literature search focused on peer-reviewed articles published between 2018 and 2023. Exceptions included literature that explained the history of key topics such as early interventions for LOS and readmissions. The main databases and websites used for the literature review included PubMed, Google Scholar,

and Medline. Government websites were also used in the literature search, which included ncmi.nlm.nig.gov, cms.gov, and ahrq.gov. The following keywords were used: *case managers, case management models, hospital discharge planning, CHF, LOS,* and *hospital readmissions*.

Literature Review Related to Key Variables and Concepts

This literature review focused on whether the selection of a particular case management model would significantly impact hospital LOS and readmission rates for CHF patients. Several key topics were introduced to understand the clear gap in recent literature. First, I pursued a clear understanding of CHF, LOS, readmissions, and how they affect hospitals and patients. Following this, there was an explanation of hospital case managers and their vital role in discharge planning and a clear explanation of the two case management models that were implemented in the Southwest Florida hospital system. These key topics were the basis for this study because they provided a clear gap in the literature.

Congestive Heart Failure

The American Heart Association (2023) defined *CHF* as a chronic condition in which the heart cannot pump the necessary amount of blood that is needed for the body. CHF can be caused by heart abnormalities such as structural and functional issues. If the heart is damaged or stiff, the chambers of the heart can stretch, leaving the heart without the strength to pump and fill with enough blood (Mayo Foundation for Medical Education and Research, 2023). Specific issues include predispositions of coronary artery disease, heart attack, high blood pressure, heart valve disease, diabetes mellitus,

hypertension, myocarditis, and uncontrolled arrhythmia. It is imperative to know the etiologies of the CHF to reduce the risk of inappropriate treatment (Malik et al., 2022; Mayo Foundation for Medical Education and Research, 2023).

There are three types of heart failure: left-sided heart failure, right-sided heart failure, and high-output heart failure (American Heart Association, 2023). To determine the type of heart failure, symptoms and ejection fraction must be evaluated. Malik et al. (2022) mentioned that the most common test used to diagnose CHF is echocardiography. Echocardiography assesses blood pressure dysfunctions and abnormalities of focal wall motion. If a patient is more medically complex, such as being obese or pregnant, transesophageal echocardiography may be more appropriate. Transesophageal echocardiography allows for clearer images because it creates pictures from inside the body (Malik et al., 2022). Symptoms of CHF include shortness of breath, chest pain, fatigue, heart palpitations, weight gain, swelling, dry cough, hard or bloated stomach, nausea, and loss of appetite. Signs and symptoms of CHF can change over time, especially as the disease progresses (American Heart Association, 2023).

The Mayo Foundation for Medical Education and Research (2023) described prevention as one way to treat and control conditions that could cause heart failure. Conditions that could be controlled include high blood pressure, diabetes, obesity, and coronary artery disease. Ways to control these preventative conditions include refraining from smoking, exercising, healthy eating, controlling weight, stress management, and taking medications as directed by physicians (Mayo Foundation for Medical Education and Research, 2023). Medication nonadherence remains a significant issue for CHF

patients and is a primary reason for CHF readmissions. Counseling, education, and implementation of preventive strategies for CHF patients is vital to decrease chances of mortality, morbidity, continual development of CHF, and hospitalizations (Abovich et al., 2023; Rehman et al., 2019).

Malik et al. (2022) observed how CHF affects millions of individuals worldwide and is known for having a high mortality and morbidity rate. Malik et al. stated that early diagnosis and effective treatment are imperative to improve patients' outcomes and quality of life. Malik et al. explained how treatment must be addressed using an interprofessional team approach that ensures proper medication regimen, patient education, and prevention of CHF exacerbations. Highly trained case managers are an integral part of the health professions team and can assist CHF patients by providing resources and arranging care in the community. Appropriate collaboration can improve the overall quality of life for CHF patients while preventing or reducing the frequency of hospital admissions to manage the disease (Malik et al., 2022).

Chronic diseases such as CHF are considered one of the costliest populations. This large group of individuals have almost quadruple the number of medical bills and are 3 times more likely to be hospitalized than the average person (McLaughlin-Davis, 2019). CHF is one of the leading reasons for hospitalization, making up almost 4 million admissions annually. As CHF admissions rise, the cost also increases and is projected to be nearly 50 billion by 2030 (S. Y. Wang et al., 2021; Zilberberg et al., 2023). These statistics have caught the attention of health care leaders and are the primary reason that CHF was the focus diagnosis of the current study.

Length of Stay

Hospital LOS has been recognized globally due to major concerns of the rising costs of health care. *LOS* is defined as the number of days a patient is admitted to a hospital during a single admission (Stone et al., 2022). LOS is a complex concept that dates back to the 1970s (Abela et al., 2019). LOS can be affected by many different factors such as a patient's comorbidities, presenting issues, discharge planning complications, and complex treatment course. Unnecessary days in the hospital could increase the risk of falls, hospital-acquired infections, and medication errors (Stone et al., 2022). Long LOS can also cause crowding in the ED, in the critical care units, and on the medical floors. If hospitals become overcrowded, then there is a higher risk of negative patient outcomes and increased chance of poor patient satisfaction (Siddique et al., 2021).

Hospital administrators have placed increasing emphasis on LOS because it is commonly used as a metric of hospital efficiency and quality of care (Hughes et al., 2021; OECD Data, 2023). According to the Acute Inpatient PPS (CMS.gov, 2023a), since the implementation of the inpatient prospective payment system, part of the value-based purchasing program under the Social Security Act, CMS categorizes cases by a DRG. A DRG is assigned to every patient admitted to the hospital based on their reason for admission (CMS.gov, 2023a). This payment system provides a fixed reimbursement for DRGs. Due to this fixed payment, hospitals are incentivized to lower LOS because they will receive the same reimbursement regardless of how many days a patient spends in the hospital (Hughes et al., 2021; Rachoin et al., 2020).

CHF hospital admissions have been associated with longer LOS, leading to increased costs and higher mortality rates (Tigabe Tekle et al., 2022). Health care administrators are striving for interventions that could assist in the reduction of hospital stays. One intervention that has shown a significant decrease in hospital LOS is initiating the discharge planning process as early as possible, preferably at the time of the initial assessment by both the physician and case manager (Bajorek & McElroy, 2020).

Case management plays a significant role in the discharge planning process, but there was a clear gap in the literature regarding the optimal case management model to reduce LOS. Siddique et al. (2021) evaluated systematic reviews that assessed discharge planning and LOS and found mixed reviews. One review indicated that a nurse-led case management team increased LOS but reduced readmission rates. Another review indicated that a case management team of clinical nurse specialists had successfully decreased LOS. The difference in findings could be caused by organizational differences such as community hospitals and academic medical centers (Siddique et al., 2021). Continued research is needed to identify optimal case management interventions that can decrease LOS in a variety of health care organizations.

Readmissions

CHF affects over 6 million people per year and is the most common cause of hospital admission in the United States (American Heart Association, 2023). Having the highest 30-day readmission rate, CHF accounts for almost 23% of total hospital readmissions (Nair et al., 2020). Khan et al. (2021) found that 1 in 4 CHF patients readmit within 30 days of hospital discharge, and about 50% readmit within 6 months. It

is estimated by 2030 there will be almost 8.5 million people with CHF, which is about a 24% increase in CHF patients in 10 years (Urbich et al., 2020). With the drastic increase of patients diagnosed with CHF, there will also be a spike in CHF hospital readmissions in years to come.

Hospital readmissions have been a priority for health care leaders since the implementation of Medicare's Hospital Readmissions Reduction Program (HRRP). CMS defined the HRRP as a value-based purchasing program that encourages hospitals to engage patients in their care by improving communication and increasing coordination of care with hopes of reducing hospital readmissions (CMS.gov, 2022). Approximately 75% of all hospitals are penalized for having excess readmissions for conditions such as CHF (Yakusheva & Hoffman, 2020). Readmissions under the HRRP are those unplanned readmissions occurring within 30 days of discharge to the same hospital or another acute care facility (CMS.gov, 2022). Millions of dollars are withheld from hospitals, averaging $160,000 per hospital each year (Yakusheva & Hoffman, 2020).

Health care administrators need to take the necessary steps to reduce CHF readmissions with the aim of significantly reducing direct health care costs and financial penalties put forth by CMS (Urbich et al., 2020). A step in the right direction would be to improve the discharge planning process by ensuring proper coordination of care from the hospital to the next level of care. S. M. Ross (2018) noted that seamless discharge planning and proper coordination of care would include the patient and caregivers having the necessary resources, equipment, confidence, and information they need to recover in the next level of care. If this does not occur, the patient is at a higher risk of being

readmitted to the hospital (S. M. Ross, 2018). Having a seamless discharge plan can result in reduced readmissions (Hunt-O'Connor et al., 2021) and solidifies the importance of implementing an optimal case management model to assist in this process.

Case Management

Giardino and De Jesus (2023) defined *case management* as a process in which a health care professional assists patients through the complex health care system by developing and coordinating plans to optimize health care outcomes. Case management is responsible for a variety of tasks due to its prevalence is many health care settings (Giardino & De Jesus, 2023). Health care settings include hospitals, skilled nursing facilities, home health care agencies, insurance companies, and ambulatory settings. The Case Management Society of America (2023) defined *case managers* as professionals in health care who advocate for patients, families, and caregivers by supporting, guiding, and coordinating care. Hospital case managers are highly trained critical thinkers who use their skills to identify appropriate providers and facilities for continued care while ensuring resources are being used in a timely and cost-effective manner. By doing so, the case managers ensure that patients and the health care system are receiving optimum value, both medically and financially (Case Management Society of America, 2023).

Case management has been used as a quality improvement effort to assist in improving quality of care for patients. Case managers support clinicians by anticipating patients' needs, thereby improving patients' outcomes. To anticipate needs, case managers assess, plan, implement, evaluate, and interact with patients and families to develop the best discharge plan (McCants et al., 2019). For example, a patient is admitted

to the hospital due to multiple falls at home. The case manager finds that the patient lives alone, does not have any local support system, and could benefit from physical and occupational therapy. The case manager works with the patient's multidisciplinary team and concludes that the safest discharge plan is for the patient to discharge to a skilled nursing facility for short-term rehabilitation. The case manager effectively and efficiently coordinates the discharge plan with the goal of reducing hospital LOS and decreasing the chance of readmission (Hill, 2019).

Discharge Planning

Case managers are a vital part of the discharge planning process. P. R. Patel and Bechmann (2023) defined *discharge planning* as the process of transitioning patients to another level of health care, such as from a hospital to a skilled nursing facility. Discharge plans are unique to each patient and provide a clear process of the next steps of care. Best practice includes discharge planning initiation within the first 24 hours of hospital admission. The earlier the planning, the more time a case manager has to provide adequate coordination of care (P. R. Patel & Bechmann, 2023).

The main objective of discharge planning for patients is to ensure a continuation of care between the hospital and community (Shabani et al., 2021). To ensure successful continuation of care, the hospital case manager completes an initial assessment of each patient within 24 hours of hospital admission. The initial assessment includes an evaluation of the patient's activities of daily living prior to admission, the type of home environment they live in, whether the patient has a history of outpatient services, whether the patient uses any durable medical equipment (DME), and whether the patient has any

family/assistance when leaving the hospital. Discharge planning assessments can also include questions relating to affordability, such as whether patients can afford medications, food, housing, and so on (P. R. Patel &Bechmann, 2023).

Liu and Eicher-Miller (2021) wrote that food insecurity is a major health concern in the US and has tripled since 2019. Significant evidence has shown that food insecurity has led to negative health outcomes such as increased risk of chronic diseases like CHF. Liu and Eicher-Miller (2021) described how food insecurity caused dietary risk factors including low consumption of vegetables, fruits, seafood omega-3 fats, nuts, and seeds and a high intake of processed meats, sodium, and sugar-sweetened beverages. A link has been found between food insecure individuals, medication non-compliance, and compromised cardiovascular health (Liu & Eicher-Miller, 2021). Case managers can assist with this aspect of discharge planning by coordinating with community programs such as the Nutrition & Activity Program of Collier County. This program promotes better health by providing nutritious meals and education to elderly citizens (Senior Citizens Nutrition & Activity Program, 2023).

Discharge planning is especially important for patients who have chronic conditions such as CHF. An effective discharge plan has been shown to improve a patients' quality of life as well as reduce chances of readmission (Abela et al., 2019). Individuals with chronic diseases are more likely to be admitted to the hospital and need post discharge services. For example, if a patient has CHF, they are more likely to have a heart attack or stroke, which will require a more in-depth discharge plan. Depending on the severity of the major life event, the patient could require numerous services such as

home health care, admission to a skilled nursing facility (SNF) or inpatient rehabilitation facility (IRF), and even DME such as a walker, wheelchair, oxygen, hospital bed, etc. The case manager is responsible for the coordination of care for chronic patients by providing the best discharge plan and transition out of the hospital (P.R. Patel & Bechmann, 2023).

To create a seamless transition, research found that a multidisciplinary team collaborates in the discharge planning process. A multidisciplinary team includes a variety of health care providers as well as the patient, family, and caregivers (Hill, 2019). Case managers are a vital part of the multidisciplinary team because they are highly trained in the discharge planning process. Case managers play a significant role in helping those with chronic diseases get the appropriate care after discharge by ensuring constant communication and collaboration across all disciplines. Health care professionals include pharmacists, therapists, physicians, nurses, and even specialty care such as the palliative care team. The more effective communication and collaboration, the more likely patients and their families will understand the discharge plan (Heidenreich et al., 2022). If executed appropriately and seamlessly, there is a decreased probability of rehospitalization, thereby creating improved outcomes and a better quality of life (Hill, 2019).

Case Management Models

Case management has been around for more than a century and is commonly practiced in the nursing and social service disciplines (Klaehn et al., 2022). Ideally, a case management model includes a collaboration of health care professionals, but little

research has been done to determine which specific case management model has the most success in reducing CHF LOS and readmissions. After a detailed review of case management model literature, there was minimal current information found relating to the topic of this study. The most pertinent literature found is written by Bisiani and Jurgens (2015), Huntley et al. (2016), and McCants et al. (2019).

Bisiani & Jurgens (2015) compared two case management models on readmission rates in an acute care community hospital in New York. The research had a sufficient sample size and included patient's age, diagnosis, insurance carrier, admission source, where the patient was discharged, and if they readmitted within 30 days of discharge. The post model structure had additional case managers compared to the pre model structure and included RNs, MSWs, and case assistants. The study found that additional staff and a collaborative case management model did not impact readmission rates (Bisiani & Jurgens, 2015). The research by Bisiani and Jurgens (2015) does discuss specific case management team members and their educational backgrounds, but the study was completed in 2015, using data from 2011 and 2012, making the information greater than five years old.

Huntley et al. (2016) completed a systematic review and meta-analysis of 17 studies describing hospital-initiated case management for CHF patients and its effect on LOS and readmissions. The conclusions of these studies found that hospital-initiated case management can have a positive impact on reducing LOS and readmissions, but a majority of the studies lacked specific case management model details. Huntley et al. (2016) concluded that the studies continuously used the term case manager but no

mention of specific health care professionals. Although the study is greater than five years old, it provides information from numerous studies on the importance of hospital case managers and the significant impact they can have on LOS and readmissions.

McCants et al. (2019) conducted a study that evaluated the implementation of case management services where the team consisted of social workers and nurses. The case managers addressed high risk patients, specifically those with heart failure and diabetes (McCants et al., 2019). The study does provide evidence that a nurse/social worker led case management model has impacted readmissions, but with the small sample size and lack of educational diversity, the study lacks generalizability.

Literature Review Summary

Several significant topics were discussed in the literature review including detailed definitions of CHF, LOS, and readmissions and how they negatively affect hospitals and patients. Next, an in-depth description of case managers and their vital role in the discharge planning process. The literature review concludes with an overview of case management models used in prior research, adding additional insight to case management's impact on LOS and readmissions.

With this in-depth review, it is clear that hospital administrators are searching for strategies to reduce LOS and readmissions for CHF patients due to high costs, unnecessary utilization of resources, decreased quality of life, and suboptimal outcomes for patients (Harris & Popejoy, 2019; Malik et al., 2022; Urbich et al., 2020). The literature showed how essential case managers are in the discharge planning process as well as emphasized the importance of a strong discharge plan (McCants et al., 2019).

This is why distinguishing which case management model is superior in reducing hospital LOS and readmissions for CHF patients is a high priority for health care systems around the world.

Case Management Model Definitions

Case Management Model 1

The first model, implemented from August 2020 to August 2021, consisted of a team of master's level social workers and discharge assistants. The two disciplines worked together to make the discharge process as efficient and effective as possible. The average ratio was one MSW to 20-25 patients and one DPA per 50-60 patients.

Master's Level Social Worker. To be hired as an MSW case manager in the health care system in Southwest Florida, the applicant is required to have a master's degree in social work from an accredited school as well as 1-2 years of experience in the field of social work. The hospital is a fast paced, medical environment so the MSW must think critically, be familiar with medical terminology, and be aware of the continuation of care facilities and agencies. This MSW position is responsible for effective and efficient utilization of hospital resources to assist patients in receiving quality care in the hospital and post hospital stay. The MSW must assess and address psychosocial and discharge planning concerns as well as provide emotional support to patients and families. Specific day to day tasks includes SNF placement, return or new placement in an assisted living facility, social issues such as homelessness or substance use disorders, arranging DME in the home, setting up home health care (HHC), and arranging outpatient services such as

therapy or infusion services. The MSW is also responsible for mental health patients, including Baker Acts and Marchman Acts (Savista, 2023).

Discharge Planning Assistant. To be hired as a DPA for the case management department at the health care system, the applicant is required to have a high school diploma or GED and have a minimum of 1 years' experience in the health care field. It is recommended that the applicant have knowledge of medical terminology, an understanding of basic technology, and be familiar with Medicare, Medicaid, and other insurance policies and regulations. DPAs must have the ability to work independently, have strong written and verbal communication skills, and demonstrate the ability to problem solve when needed. Daily tasks for a DPA include arranging transportation, speaking with patients about after care choices such as HHC and SNF options, making discharge packets, faxing, follow up phone calls, and delivering the required Medicare forms to patients. The main objective of a DPA is to constantly communicate and assist the MSWs by taking initiative of the clerical portion of the discharge planning process (Savista, 2023).

Case Management Model 2

The second model, implemented from September 2021 to August 2022, consisted of a team of MSWs, DPAs, RNs, and CCs. The four disciplines of the case management team worked together to assess and coordinate care for the hospital system. The ratio for the MSWs, RNs, and CCs was about 15-20 patients and DPAs had about 40-50 patients. The qualifications for the MSWs and DPAs are the same as described previously for the Case Management Model 1.

Registered Nurse. To be hired as an RN case manager, the applicant must have a bachelor's degree in nursing or an associate's degree in nursing with a bachelor's degree in a related field. The RN is also required to have an active FL RN license and three years of hospital nursing experience. The RN case manager uses their nursing expertise to assess patient's needs, appropriateness of treatment setting, and handle medically complex discharge plans. The RN case manager is a resource for physicians and mid-level providers in the determination of the proper level of care and monitors the appropriateness of extended hospital stays. Complex medical discharges include arrangement of outpatient needs such as intravenous antibiotics, wound vacuum-assisted closure, total parenteral nutrition, and home ventilators. The RN case manager will also be responsible for hospital-to-hospital transfers as well as medically assessing patients that have been admitted for five days or more. The RN will work with the MSW, CC, and DPA to ensure that designated clinical, operational, and financial outcomes of the facility are met. The patient case load can vary depending on the complexity of patients and their LOS, but averages around 15-20 patients per RN case manager (Savista, 2023).

Care Coordinator. The CC is a unique position that was created to bridge the gap of case management assistance due to the lack of qualified MSWs and RNs in some markets including Southwest Florida (Ferguson & Quigley-Stickney, 2023). The applicant must have a bachelor's degree in social work, licensed practical nurse, or a bachelor's degree in a related field. 1-2 years of experience in a hospital setting is also required for the CC position. A CC must encompass strong verbal and written communication skills, ability to prioritize and manage time, and work independently. The

CC position is similar to the MSW position mentioned previously in this study, but on a smaller, simpler scale. Many CCs are working towards their master's degree in social work and use this position as a steppingstone into the social work hospital setting. The CC primarily focuses on discharges to SNFs, assisted living facilities, and patients that need HHC. They can arrange DME and transport and are responsible for discussing simple discharge plans with patients and families. The CCs are commonly placed on a floor with a MSW or RN and usually have 15- 20 patients (Savista, 2023).

Case Management Job Responsibilities

The significant difference between the two case management models is the qualifications of the team members. Case Management Model 1 included MSW case managers and DPAs. The MSW is responsible for every patient assigned to their unit and must complete all required tasks in an efficient and effective manner. The DPA assists the MSW with simple tasks as defined above in their job description. Case Management Model 2 includes MSW case managers, RN case managers, CCs, and DPAs. This model includes more diverse qualifications, making this model more of a multidisciplinary approach. For example, if a patient is more clinically complicated, the RN case manager may assist the patient. If a patient has more complicated social needs, the MSW case manager would help the patient. The CC is a unique position that encompasses team members that are not MSWs or RNs but have a bachelor's degree in a related health field. The CC partners with more experienced team members if assistance is needed, but they are still qualified to perform daily case management tasks. The DPA responsibilities are identical for both case management models.

Case Management Metrics

The metrics for both Case Management Model 1 and Case Management Model 2 are the same. The case management department is evaluated based on three quality metrics: completing initial assessments on all patients within 24 hours of admissions, providing appropriate Medicare forms within 48 hours of hospital discharge, and completing the final discharge documentation on all patients prior to hospital discharge. Both case management models must be compliant with these metrics to stay in good standing with the hospital's quality department.

Case Management Daily Routine

The daily routine for a case manager, for either of the case management models, begins with screening all new patients on their assigned unit. Screening patients entails looking through the electronic medical records to assess patients for possible discharge needs. A general rubric is used to evaluate the patients and includes criteria such as admitting diagnosis, number of ED visits, age, and if the encounter is a readmission. Any patient that screens in will be assessed at bedside by the MSW case manager, RN case manager, or CC. The initial assessment is then documented in the electronic medical records and can be seen by anyone that has access to the patient's medical record.

The case manager attends multidisciplinary rounds every morning on their assigned unit. Multidisciplinary rounds include the floor nurses, physicians, nursing management, therapy, pharmacy, nurse navigators, and case management. During rounds, each patient is discussed in order of room number and main topics include discharge plans, barriers, and expected discharge date. Research has found that multidisciplinary

rounds significantly decrease 30-day readmissions and LOS for CHF patients (Chava et al., 2019). Chava et al. (2019) found the mean LOS decreased by 0.7 days and readmissions decreased by 10.38% after implementing multidisciplinary rounds. The study also included that multidisciplinary rounds immensely benefited CHF patients and should be utilized in all hospital systems (Chava et al., 2019).

The case manager strategically organizes their tasks based on priority. For example, the case manager would complete initial assessments within the 24 hours of admission to ensure metrics are met then focus on patient's that are planned for discharge that day. Case managers are constantly multitasking and using critical thinking skills in order to discharge patients as effectively and efficiently as possible. Without utilization of the optimal case management team model, discharges could be delayed, increasing LOS and possibly increasing the risk of patients readmitting to the hospital.

Additional Definitions

Case Management Model 1: Implemented at a health care system in Southwest Florida from August 2020 to August 2021 and consists of a team of MSWs and DPAs (Savista, 2023).

Case Management Model 2: Implemented at a health care system in Southwest Florida from September 2021 to August 2022 and consists of a team of MSWs, RNs, CCs, and DPAs (Savista, 2023).

Centers for Medicare and Medicaid Services (CMS): A department within the U.S. Department of Health and Human Services (HHS) that administers and oversees

health care programs for the elderly, medically needy, and children (CMS Glossary, 2023).

Congestive Heart Failure: A serious heart condition that occurs when the heart muscle does not pump properly, causing blood to back up (Mayo Foundation for Medical Education and Research, 2023).

Discharge Planning: The process of transitioning a patient to a different level of care, commonly from a hospital setting (P.R. Patel & Bechmann, 2023).

Hospital Case Management: Also known as care coordination, case management is an essential role within a hospital system that manages complex physical and social problems, assists patients and families through the complex health care setting, as well as plans and arranges care post discharge (Harris & Popejoy, 2019).

Hospital Readmissions Reduction Program (HRRP): Value-based purchasing program through Medicare that helps reduce avoidable readmissions by encouraging hospitals to improve communication and care coordination (Hospital Readmissions Reduction Program, 2022).

Length of Stay: A quality health systems metric that calculates the number of days a patient stays in the hospital from admission to discharge (Siddique et al., 2021).

Readmission: An unplanned return to any hospital setting within 30 days of an initial hospital admission (Hospital Readmissions Reduction Program, 2022).

Assumptions

There are several assumptions made for this study such as the implementation of a particular case management model may reduce CHF LOS and readmissions. Another

assumption is that every patient within the dedicated time frames of the two case management models were seen and evaluated by a case manager. Finally, it is assumed that each CHF patient admitted received appropriate medical care for CHF and any active co-morbidities, thereby reducing LOS and the risk for readmission.

Scope and Delimitations

The scope of the study is to analyze if a particular case management model had a significant impact on CHF LOS and hospital readmissions during a two-year time frame. Specifically, Case Management Model 1 was implemented from August 2020 to August 2021 and Case Management Model 2 was implemented from September 2021 to August 2022. The delimitations in this study included adult patients, 18 years and older, who were admitted to the hospital with a diagnosis of CHF. Delimitations are controlled boundaries that are established by the researcher (Theofanidis & Antigoni, 2019). The data was taken from a hospital system in Southwest Florida and will exclude planned hospital readmissions. The generalizability of the study was affected due to the specific location in Southwest Florida, so the results may or may not be applicable to other areas.

Limitations

The study included several limitations. Limitations are the variables within the study that may influence outcomes of the research (Ross & Bibler Zaidi, 2019). First, data for the study is from a two-hospital system in Southwest Florida so the results may not apply to other geographic regions. Another limitation is the hospital system is in an area where the population fluctuates depending on the time of year, so the sample size varies. An additional limitation is that patients may have been readmitted to another

facility outside of this hospital system. Finally, some of the data in this study was during the COVID-19 pandemic. During this pandemic there was a reduction in CHF admissions worldwide due quarantine. Individuals were encouraged to manage their CHF symptoms from home, thus avoiding hospitalizations (Hamilton et al., 2022).

Significance

This study addressed the research gap of how case management models may affect the discharge planning process for CHF patients and whether this might in turn affect these patients' LOS and readmission rates. Health care administrators can use the information gained from this study to improve the case management department as well as decrease CHF LOS and readmission rates. To date, there is no evidence that a specific case management model can positively impact LOS and readmission rates for CHF patients in Southwest Florida. With this knowledge, leaders will be able to improve the hospital's quality of care, provide patients with better outcomes, thereby providing an overall better quality of life.

The results of the study add to the growing body of knowledge of how case management models may impact hospital LOS and readmission rates for CHF patients. Further, the results of this study may impact future research where the optimal case management model identified in this study can be applied to other diagnoses to further test the strength of the model. The knowledge gained will help health care administrators choose an appropriate case management model that assists in the reduction of LOS and readmissions, thus creating positive social change.

Summary and Conclusions

This study used secondary data to determine if there is an association between case management model utilization and hospital LOS as well as hospital 30-day readmission rates for CHF patients in Southwest Florida. The research is designed to analyze if a specific case management model impacted CHF hospital LOS and readmissions more than the other. Case Management Model 1and Case Management Model 2 were both implemented for 1 year, between 2020 and 2022. Health care administrators can use this information to determine the impact a particular case management model could have on CHF LOS and readmission rates.

The literature review covers key topics including CHF, LOS, readmissions, and the importance of case management and discharge planning. The review highlights the overwhelming need to reduce hospital LOS and readmission rates to decrease health care costs and significantly improve patient outcomes (Malik et al., 2022). With CHF being a top contributor to long LOS and readmissions, health care administrators should make this chronic condition a main focus in their initiative to decrease costs.

Section 1 includes the background of the study, the problem, the purpose, the RQs and hypotheses, the theoretical foundation, the nature of the study, and a literature review. In Section 2, I present an overview of the research design, methodology, threats to validity and ethical procedures.

Section 2: Research Design and Data Collection

The purpose of this quantitative study was to examine the impact of two case management models on hospital LOS and readmission rates within 30 days of hospital discharge for CHF patients. In this study, age and gender were also included in the model as confounding variables. Case Management Model 1 was implemented from August 2020 to August 2021, and consisted of a team of MSWs and DPAs. Case Management Model 2 was implemented from September 2021 to August 2022 and consisted of a team of MSWs, DPAs, RNs, and CCs. An analysis needed to be completed due to the lack of evidence regarding the optimal case management model needed to reduce LOS and readmissions within 30 days of hospital discharge. The analysis included one independent variable and two dependent variables. The independent variable was the case management models and the dependent variables were hospital LOS and readmission rates for CHF patients.

This section first addresses the research design and rationale. This section also provides information on methodology including the population, sampling, sampling procedures, instrumentation and operationalization of constructs, and data analysis. In addition, this section provides information on the threats to validity and ethical principles. The section concludes with a summary.

Research Design and Rationale

This retrospective quantitative study evaluated the LOS and readmission rates of CHF patients who were admitted to a Southwest Florida health care system between August 2020 and August 2022. During this time, patients admitted with a primary

diagnosis of CHF were grouped into either Case Management Model 1 or Case Management Model 2 based on the admission date. An analysis needed to be completed to determine whether there was an association between the primary variables including LOS and readmission rates (dependent variables) and the two case management models (independent variable) while adjusting for the potentially confounding variables of age and gender. Sensitivity analysis models were formulated to evaluate the robustness of the findings in relation to variations in model specification.

First, the relationship between the case management models and LOS was investigated using an independent *t* test to compare the means of the number of days admitted between the two case management models. For violations to normality, Mann-Whitney U test was applied. Second, the relationship between the case management models and LOS including age and gender as confounding variables was analyzed using general linear model (GLM). Here, interaction terms between the case management model and confounding variables were included to observe the effect of case management on LOS based on age and gender. For violations to the assumptions, nonparametric generalized linear model was applied.

Third, the relationship between the case management models and readmission was investigated using a chi-square test. Lastly, the relationship between the case management models and readmission including age and gender as confounding variables was analyzed using GLM. Here, interaction terms between the case management model and confounding variables were included to observe the effect of case management on

readmission based on age and gender. For violations to the assumptions, nonparametric generalized linear model was applied.

The study's design choice included a secondary data set, which was the most appropriate design for this study. The design allowed for the determination of whether the LOS of CHF patients admitted to the Southwest Florida health care system during the study period differed between Case Management Model 1 and Case Management Model 2. The design also allowed for the determination of whether CHF patients were readmitted more often when discharged during the study period of the two case management models. This design could advance the knowledge of health care leaders in choosing the optimal case management model.

Methodology

Population

The target population for this study included patients over the age of 18 with a primary diagnosis of CHF admitted to the two-hospital health care system in Southwest Florida. This diagnosis was the focus due to the millions of people hospitalized each year with CHF and its drastic effect on health care costs (see Clark et al., 2022). The data set for the secondary data contained a total of 1,780 inpatient CHF admissions to the Florida hospital system from August 2020 to August 2022. The data set for Case Management Model 1, from August 2020 to August 2021, contained 918 inpatient CHF admissions. Case Management Model 2, from September 2021 to August 2022, contained 862 inpatient CHF admissions.

To ensure this was the appropriate sample size, I used G*Power 3.1 to conduct a power analysis on this secondary data set (see Frost, 2020). The calculation was made using a small effect size of 0.2, an error probability of 0.05, and a statistical power of 0.80. The result showed that there must be a minimum of 394 participants per group, equaling a total sample size of 788 participants. Between the 2 years of the study period, there was an adequate number of CHF admissions to the health care system to ensure a sufficient sample size.

Sampling and Sampling Procedures Used to Collect Data

The secondary data included all patients with a primary diagnosis of CHF who were admitted to either of the two hospitals within the Southwest Florida health care system between August 2020 and August 2022. The sample included 1,780 patients, with a recommended minimum sample size of 788 participants. The minimum sample size was calculated by using the G*Power 3.1 software and included the effect size (0.2), alpha error probability (0.05), statistical power (0.80), and type of power analysis (priori). The effect size value would show if there was a small (0.2), medium (0.5), or large (0.8) effect on the variables (Mcleod, 2023a). The alpha error probability, also known as significance level, is commonly 0.01, 0.05, and 0.10 and is the probability of rejecting the null hypothesis (Mcleod, 2023b). The power is the odds that a treatment effect is observed and remains constant at 0.80 (Serdar et al., 2021).

After approval from the hospital's IRB, the data were obtained from the director of the revenue cycle department at the two-hospital health care system. The secondary data included the DRG, primary admitting diagnosis, month and year patient was

admitted, the patient's LOS during the admission, age, gender, discharge disposition, and whether the patient readmitted within 30 days of discharge (NCH Revenue Cycle, 2023). Consent from participants was not required because the information was precollected and did not include live participants. I did not have independent access to the data while on duty at the health care system.

Instrumentation and Operationalization of Constructs

The two dependent variables of the study were LOS and readmissions. LOS was measured in days, expressed numerically, and was a continuous variable. Readmissions was a binary variable and was measured as 0 = no readmission and 1 = readmission. The independent variable was case management type, a binary variable categorized as either Case Management Model 1 or Case Management Model 2. Case Management Model 1 was denoted by0, and Case Management Model 2 was measured as 1. The study also contained two confounding variables: age and gender. Age was a continuous variable that was depicted as a whole number. Gender was a dichotomous variable and was recorded as 1 for male and 2 for female.

The patient's admitting diagnosis, more specifically the DRG, was the primary input for this study. The DRG was written as a numerical variable that explained the reason for the admission (CMS.gov, 2023a). I used DRG 291 (Heart Failure Shock with MCC), 292 (Heart Failure Shock with CC), and 293 (Heart Failure Shock without CC/MCC; NCH Revenue Cycle, 2023). The hospital system assigned the DRGs and was the main inclusion criterion for this study. This study included two outputs: LOS and readmissions. LOS was calculated by taking the discharge date and subtracting the

admission date. For example, if a patient was admitted on August 10, 2020 and discharged on August 15, 2020, the LOS was 5 days. Another way to calculate LOS was counting the number of midnights the patient spent in the hospital. Readmissions are defined as unplanned admissions to any health care system within 30 days of previous hospital admission (CMS.gov, 2022).

Data Analysis Plan

The primary purpose of the data analysis was to determine whether there was an association between a particular case management model, hospital LOS, and readmission rates for CHF patients. The data from the Florida health care system was analyzed using SPSS Version 27. SPSS is commonly used for solving research problems by using a hypothesis testing approach (IBM, 2023). Prior to the analysis, the data were cleaned. Cleaning the data included excluding any patients outside of the case management model time frame (August 2020 to August 2022), excluding duplicate admissions, and ensuring all patients within the data set had a primary diagnosis of CHF and were 18 years and older.

Once the data were cleaned, the categorical variables were coded. Then the descriptive statistics for the study variables were presented. These included mean and standard deviation for continuous variables, and percentages and frequencies for categorical variables.

For the first research question, independent *t* test or Mann-Whitney U test was applied to examine the association between the case management models and LOS. When incorporating the confounding variables, age and gender, I used GLM. For the

second research question, chi-square test was used to examine the association between the case management models and readmission. Then, logistic regression was used to examine the association between the case management models and readmission when incorporating age and gender. Confounding variables can have had an unintended impact on the study outcomes (see Skelly et al., 2012). It was important to determine whether confounding variables significantly influenced the LOS and readmissions for each of the case management models.

Prior to conducting the statistical tests, I conducted respective assumption checks. For the GLM, linearity, normality, homoscedasticity (constant variance), and independence of observations were confirmed. For the logistic regression, dichotomous dependent variable, one or more continuous or categorical independent variables, independence of observations, and a linear relationship between any continuous independent variables and the logit transformation of the dependent variable were confirmed. Nonparametric test, GLM, would have been used if the assumptions had not been confirmed. These analyses were used to address the RQs and hypotheses:

RQ1: Is there an association between length of stay and case management model 1 and case management model 2 for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022?

H_o1: Case management model 1 and case management model 2 are not associated with differing length of stay for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a1: Case management model 1 and case management model 2 are associated with differing length of stay for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

RQ2: Is there a difference in the effect of case management models on length of stay based on age and gender for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022?

H_o2_1: The relationship between case management models and LOS is consistent across the different ages for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a2_1: The relationship between case management models and LOS differs across the different ages for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_o2_2: The relationship between case management models and LOS is consistent across gender groups for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a2_2: The relationship between case management models and LOS differs across the gender groups for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

RQ3: Is there an association between readmission rates and case management model 1 and case management model 2 for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022?

H_o3: Case management model 1 and case management model 2 are not associated with differing readmission rates for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a3: Case management model 1 and case management model 2 are associated with differing readmission rates for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

RQ4: Is there a difference in the effect of case management models on readmission rates based on age and gender for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022?

H_o4_1: The relationship between case management models and readmission rates is consistent across the different ages for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a4_1: The relationship between case management models and readmission rates differs across the different ages for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_o4_2: The relationship between case management models and readmission rates is consistent across gender groups for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a4_2: The relationship between case management models and readmission rates differs across the gender groups for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

The study results were interpreted by determining the *p* value and comparing it to the alpha level of 0.05. Mcleod (2023b) noted that if the *p* value is less than 0.05, then the null hypothesis is rejected because the relationship between the variables is statistically significant. If the *p* value is greater than 0.05, then there is no statistical significance, the null hypothesis is retained, and the alternative hypothesis is rejected (Mcleod, 2023b).

Threats to Validity

Flannelly et al., (2018) described threats to internal validity as extraneous variables that can occur during the study but are not part of the study itself. Internal validity relates to possible bias of the study and how strong the methods are. *External validity* can be defined in a few ways but overall, it is the extent of the generalizability of the study results to other populations or groups (Jung et al., 2022). Health care research always has some variation of internal and external validity. This study included a few factors that could jeopardize validity such as the history of patients and the selection of the data (Ohlund & Yu, n.d.).

Internal Validity

The history could hinder *interval validity* and is defined as any events that occur during the study that could impact subject responses such as an incident that happened during hospitalization (Ohlund & Yu, n.d.). Adverse effects are more likely to occur if an individual has other underlying comorbidities or could even transpire if a patient refused the recommended course of treatment. An incident during the study could potentially affect LOS and may increase the chances of readmission within 30 days of discharge (see Stone et al., 2022).

External Validity

A factor that could threaten external validity is the selection of data (Ohlund & Yu, n.d.). The use of secondary data from a two-hospital health care system, in a single geographic location, may limit the application of findings to other areas. There is uncertainty that the results of this study could be applicable in other larger, rural, for-profit health care systems. There could be concern that data in this study may not be applicable to replication in a geographic area that has consistent, full-time residents. The median age of the study location could be a factor because this area in Southwest Florida has an older population with the median age of 65.4 (Naples, FL Data USA, n.d.). An older population could contain more CHF patients than in younger populated areas, hindering the generalization of the study results.

Ethical Procedures

Secondary data is used for this study so there is no direct patient contact or harm to actual human subjects. A detailed application and proposal were presented to the hospital IRB along with proof of completion of the Collaborative Institutional Training Initiative (CITI Program). The online CITI program included dozens of modules with exams that provide detailed education and training. The CITI program (2023) focused on ethics, research, regulatory requirements, research responsibilities, and other pertinent topics of interest. Once the IRB concluded that the study was appropriate and followed ethical guidelines, the proposal was approved, and access was granted for use of the secondary data. The hospital IRB approval number is IRB0015, and the Walden IRB approval number is 11-22-23-1041927. The secondary data is safeguarded by including

only de-identified data using the expert determination method, therefore minimizing the risk of participant identification. Additionally, the data is unaltered, will be on a flash drive in a locked fireproof box, and will be appropriately stored for 7 years post study.

Summary

Section 2 included the purpose and analysis of retrospective quantitative data which included the impact of case management models on LOS and readmission rates for CHF patients. The dataset spanned two years, from 2020 to 2022, and included all patients, 18 years and older, that were admitted to the Southwest Florida health care system with a primary diagnosis of CHF. Case Management Model 1 was implemented the first year (August 2020 to August 2021) and Case Management Model 2 was implemented the second year (September 2021 to August 2022). The data analyzed each patient's LOS and whether they were readmitted within 30days of hospital discharge. The methodology allowed the study to determine if implementation of a particular case management model provided benefits in terms of lowering LOS and decreasing the risk of 30day hospital readmission. Ultimately, minimizing LOS and readmissions have implications that extend far beyond current operation advantages. It is consistent with overall objectives for better patient outcomes, resource optimization, financial viability, and an environment of on-going performance improvement in health care delivery. Such a focus may redefine health care administration leading to innovative approaches that will improve the health sector.

This section included the population of the study, sampling procedures to collect data, instrumentation and operationalization of constructs, analysis plan, threats to

internal and external validity, and ethical procedures. Section 3 will include the study's results as well as thorough findings of the study.

Section 3: Presentation of the Results and Findings

The purpose of this quantitative study was to investigate how two case management models affected hospital LOS and readmission rates within 30 days of discharge for patients with CHF. Age and gender were considered confounding variables in this study. This study's findings could be used by health care administrators to design an ideal case management model that helps reduce hospital LOS and readmissions by honing the discharge planning process for these patients. Making the required efforts to reduce LOS and readmissions has been shown to lower health care costs while also improving patient outcomes, contributing to positive social change (Urbich et al., 2020).

The section begins with a recap of the study's RQs, followed by a detailed overview of the data collection procedures. Next, a summary of the participants is presented, which is followed by a discussion of the methods or statistical techniques used to carry out primary data analyses. In the results section, the descriptive statistics of the key variables are summarized using measures of dispersion and proportions, followed by the presentation of the test findings associated with the four RQs. The section concludes with a summary of the study's key findings.

Research Questions and Hypotheses

There were four RQs with corresponding null (H_0) and alternative (H_a) hypotheses based on the research gaps discovered in the recent literature:

RQ1: Is there an association between length of stay and case management model 1 and case management model 2 for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022?

H_o1: Case management model 1 and case management model 2 are not associated with differing length of stay for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a1: Case management model 1 and case management model 2 are associated with differing length of stay for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

RQ2: Is there a difference in the effect of case management models on length of stay based on age and gender for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022?

H_o2_1: The relationship between case management models and LOS is consistent across the different ages for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a2_1: The relationship between case management models and LOS differs across the different ages for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_o2_2: The relationship between case management models and LOS is consistent across gender groups for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a2_2: The relationship between case management models and LOS differs across the gender groups for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

RQ3: Is there an association between readmission rates and case management model 1 and case management model 2 for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022?

H_o3: Case management model 1 and case management model 2 are not associated with differing readmission rates for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a3: Case management model 1 and case management model 2 are associated with differing readmission rates for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

RQ4: Is there a difference in the effect of case management models on readmission rates based on age and gender for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022?

H_o4_1: The relationship between case management models and readmission rates is consistent across the different ages for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a4_1: The relationship between case management models and readmission rates differs across the different ages for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_o4_2: The relationship between case management models and readmission rates is consistent across gender groups for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

H_a4_2: The relationship between case management models and readmission rates differs across the gender groups for adult congestive heart failure patients in a Southwest Florida hospital system between 2020 and 2022.

Data Collection

The study's target population included patients over the age of 18 who were hospitalized in Southwest Florida's two-hospital health care system with a primary diagnosis of CHF. Because CHF causes millions of hospital admissions each year and has a substantial financial impact on health care, this diagnosis was prioritized (see Clark et al., 2022). The secondary data set included a total of 1,780 inpatient CHF admissions to the Florida hospital system from August 2020 to August 2022. The data set for Case Management Model 1 had 918 inpatient CHF admissions from August 2020 to August 2021, and the data set for Case Management Model 2 contained 862 inpatient CHF admissions from September 2021 to August 2022. These were ample sample sizes to investigate whether there was a relationship between the case management model and hospital LOS and readmission rates. The secondary data comprised the DRG, primary admitting diagnosis, month and year of admission, length of stay during the admission, age, gender, discharge disposition, and whether the patient was readmitted within 30 days of discharge (NCH Revenue Cycle, 2023).

The study included 1,780 patients, with a minimum sample size of 788 participants required. Table 1 summarizes the demographic characteristics of the participants. The average mean LOS was 5.3 days and did not differ statistically between the two models. Most participants (87.9%) used Medicare to pay their bills, with Model 1

having somewhat larger proportions (89.2%) in this category than Model 2 (86.6%). The source of admission varied statistically between the two models. Model 1 had many more patients from EDs (95.5%) than Model 2, which had 74.2% from EDs. Although physician referrals accounted for 13.0% of admission sources overall, Model 1 had fewer physician referrals (4.0%) than Model 2 (22.6%). The average age of the participants was 79.6 years, which did not differ statistically between the two models. Overall, there were more men (54.7%) than women (45.3%), and these results were comparable among models. In terms of readmission rates, 13.0% of patients were readmitted within 30 days of their original admission, with no statistically significant differences between the two models.

Table 1

Demographic Characteristics

Variable	All[a]	Model 1[a]	Model 2[a]	*p*[b]
n	1,780	918 (51.6)	862 (48.4)	
Length of stay (LOS): *M* [*SD*][c]	5.302 [4.316]	5.292 [4.349]	5.313 [4.283]	.917
Payor group				
Employee	3 (.2)	1 (.1)	2 (.2)	
Insurance	100 (5.6)	40 (4.4)	60 (7.0)	
Medicaid	50 (2.8)	28 (3.1)	22 (2.6)	.026
Medicare	1,561 (87.9)	819 (89.2)	742 (86.6)	
Other	31 (1.7)	20 (2.2)	11 (1.3)	
Self-pay	30 (1.7)	10 (1.1)	20 (2.3)	
Admission source				
Court/law enforcement	2 (.1)	0 (.0)	2 (.2)	
Emergency room	1,517 (85.2)	877 (95.5)	640 (74.2)	
Health maintenance organization	13 (.7)	0 (.0)	13 (1.5)	< .001
Information not available	4 (.2)	2 (.2)	2 (.2)	
Physician referral	232 (13.0)	37 (4.0)	195 (22.6)	
Transfer from a hospital	12 (.7)	2 (.2)	10 (1.2)	
Age in years: *M* [*SD*]	79.640 [10.426]	79.920 [9.941]	79.340 [10.914]	.917
Gender				
Male	955 (54.7)	479 (53.3)	476 (56.1)	.242
Female	791 (45.3)	419 (46.7)	372 (43.9)	
Readmission				
No	1,463 (87.0)	800 (87.1)	663 (86.8)	.824
Yes	219 (13.0)	118 (12.9)	101 (13.2)	

[a] Proportions are column percentages.
[b] Pearson chi-square for proportions and analysis of variance test for means.
[c] *M* = Mean; *SD* = standard deviation.

Results

The study's major goal was to determine whether there was a preferred case management model to positively impact hospital LOS and readmission rates for CHF patients. SPSS Version 27 was used for analyzing data from the Florida health care system. One independent variable and two dependent variables were included in the analyses. The case management models were the independent variables, which were measured in two categories, while the dependent variables were hospital LOS and readmission rates for CHF patients. To investigate the relationship between case management models and LOS, an independent *t* test was conducted for the first RQ. For RQ2, a GLM including confounding variables age and gender was conducted. The chi-square test was conducted for the third RQ to examine the relationship between case management models and readmission. For RQ4, logistic regression was conducted to examine the relationship between case management models and readmission with age and gender included as controlling variables.

Assumption Analysis

Some assumptions had to be met to apply the four statistical models and obtain valid results. Independent *t* test, GLM, chi-square test, and logistical regression analysis were the statistical models used. Although these statistical models were robust, I assessed the quality of the results by examining the degree of divergence from these assumptions.

The chi-square test was unique among the four because, unlike the other statistics, it is a nonparametric test that does not rely on assumptions about population parameters or data distribution (see McHugh, 2013). In contrast, parametric tests make assumptions

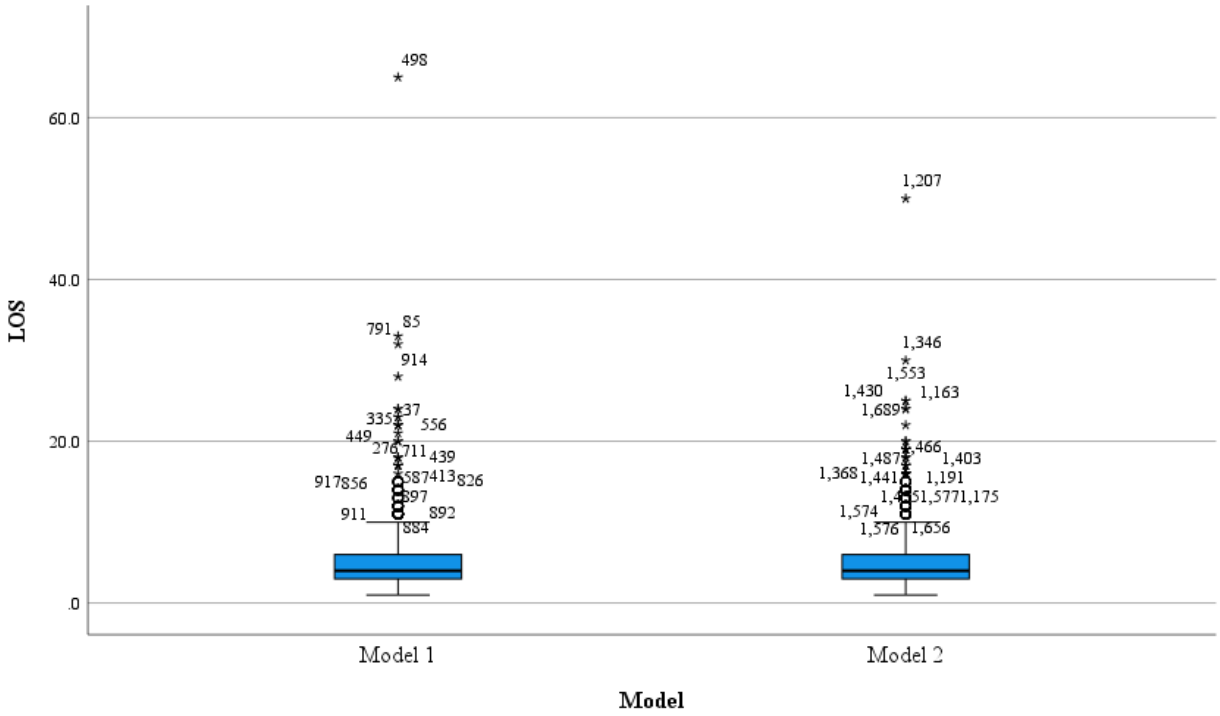
about population parameters (such as mean and variance) and data distribution, typically assuming normality. The chi-square makes only one assumption: The two variables must be measured at an ordinal or nominal level (i.e., categorical data) and must consist of two or more categorical, independent groups (McHugh, 2013). The independent variable of the case management models (Model 1 and Model 2) and the dependent variable of readmission rates, measured as a binary yes/no response, were both tested using chi-square tests.

The other three statistical tests had the following common assumptions that were tested: (a) independence of observations, (b) no significant outliers, (c) the dependent variables should be approximately normally distributed for each group of the independent variable, (d) there needs to be homogeneity of variances, and (e) there needs to be a linear relationship between any continuous independent variables and the logit transformation of the dependent variable (specific for logistic regression). To test the presence of the assumption of observational independence, I used the Durbin-Watson statistic. Because each observation in the data was presumed to be unrelated to the others, the value of one observation did not influence the value of the others. Durbin-Watson also addresses the assumption of error independence. This statistic has a value range of 0.0 to 4.0, with a value of 2.0 indicating that there is no association between the residuals. Values lower than 1.0 and higher than 3.0 are considered troublesome and indicate serial correlation in the model (Turner et al., 2021). The model used in the current study had a Durbin-Watson score of 2.067, indicating that it did not contravene this assumption.

The next assumption required that there be no notable outliers, high leverage points, or highly significant points. This was true for both the independent *t* test and the GLM. This assumption was tested using box plots. Cook's distance was investigated in addition to the visual inspection of box plots to rule out an unreasonable influence of outliers on the analysis. In this context, values of 1.0 or more are considered concerning because they imply an undue impact may exist (Gao et al., 2015). There were a lot of outliers in both models, according to the box plot in Figure 1 of the major dependent variable, LOS. However, their influence in the study was minimal based on the Cook's distance minimum and maximum range of 0.000 to 0.104, which was under the threshold of no significant impact on analysis.

Figure 1

Box Plot Showing Distribution of Data



The Shapiro-Wilk test was used to determine whether the data set came from a normally distributed population and whether the dependent variable (LOS) was approximately normally distributed for each group of the independent variable (models). Under the assumption of normality, the test computes a test statistic based on the discrepancies between observed and predicted values (Mishra et al., 2019). The test's null hypothesis is that the data are normally distributed. If the *p* value from the Shapiro-Wilk test is lower than a predetermined significance level (0.05 in this case), the null hypothesis is rejected, suggesting that the data deviate considerably from a normal distribution. Based on the *p* values of both models, which were lower than the 0.05 threshold, the test findings suggested that the data did not follow a normal distribution (see Table 2).

Table 2

Shapiro-Wilk Test of Normality

Variable	Model	Statistic	*df*	*p*
LOS	Model 1	.686	918	< .001
	Model 2	.755	862	< .001

The fourth assumption on variance homogeneity, commonly known as homoscedasticity, was the next to be evaluated. It denotes the condition in which the variance of the residuals (the differences between observed and predicted values) is consistent across independent variable(s) levels (Wang et al., 2017). It suggests that the variability or spread of data points around the mean is similar among groups (models). I utilized Levene's test to measure variance homogeneity between two models. It calculates a test statistic based on the discrepancies between individual values and their

corresponding group means to determine whether the variances of the two models are approximately comparable or significantly different from each other. The null hypothesis posits that all group variances are equal, but the alternative hypothesis states that at least one group's variance differs significantly from the others. If the resulting *p* value from Levene's Test is less than the specified significance level (usually 0.05), it indicates evidence to reject the null hypothesis. It implies that the variances of at least two groups differ significantly. Table 3 summarizes the test results, which show that the *p* values were more than 0.05, indicating that the null hypothesis was accepted and that the variances across the models were equal.

Table 3

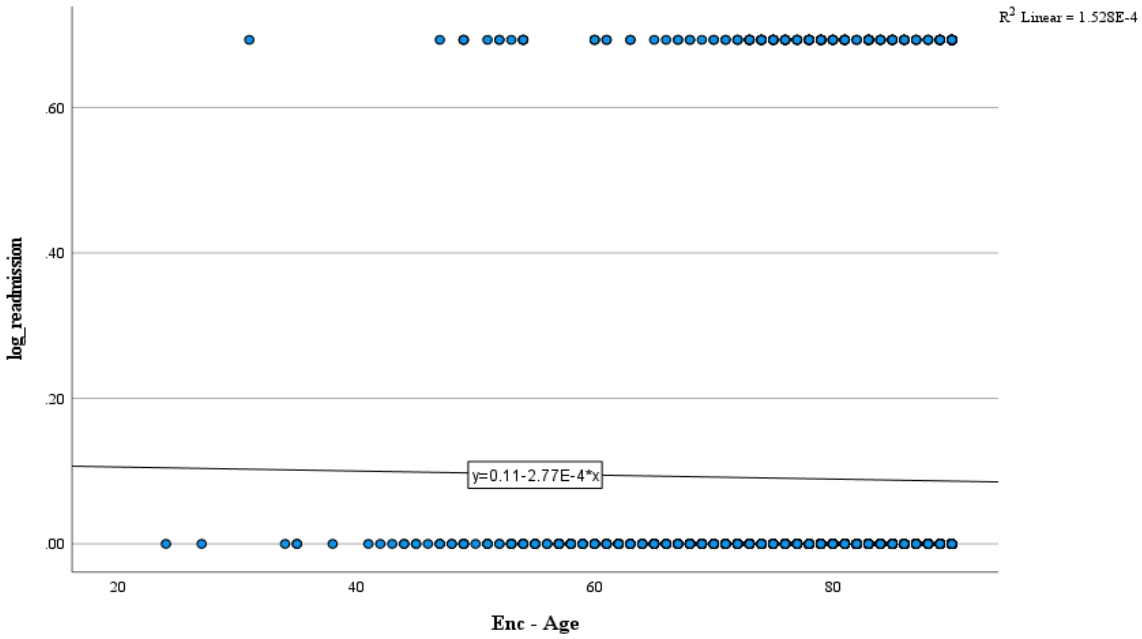
Levene's Test of Homogeneity of Variance

Category	Statistic	*df*1	*df*2	*p*
Based on mean	.951	1	1778	.33
Based on median	.465	1	1778	.495
Based on median and with adjusted *df*	.465	1	1774.799	.495
Based on trimmed mean	.71	1	1778	.4

The binomial logistic regression assumption that a linear relationship existed between any continuous independent variables and the logit transformation of the dependent variable was evaluated using a scatter plot. *F* age of the patients was the only continuous independent variable in the model, and it was plotted against the log transformation of the dependent variable of readmission rates. A visual examination of the scatter graph revealed some, albeit weak, linearity (see Figure 2).

Figure 2

Scatterplot Between Log Transformed Dependent Variable (Readmission) and Age of Patients



Based on the assumption analysis, I opted to use the Mann-Whitney U test, a nonparametric alternative to the independent *t* test. The assumption analysis revealed numerous violations, such as outliers and the dependent variable not being approximately normally distributed for each independent variable category. Preliminary analyses were performed in the case of GLM and logistic regression to determine whether the assumptions of outliers, normality, linearity, and homoscedasticity were met; some violations were observed, but I believe they would not have a significant impact on the analyses and interpretations.

Descriptive Analysis

The descriptive statistics for the research variables are shown in Table 4. The measurements of dispersions of mean, standard deviations, and medians are presented, with the analysis broken down per implementation model. Kurtosis and skewness distribution measurements are also displayed. The standard deviations appeared to be considerable, indicating that the data were distant from the mean. Kurtosis and skewness data indicated that the data were dispersed and did not come from a normally distributed population because they were outside of the -1 and +1 ranges (see Kim, 2013).

Table 4

Descriptive Statistics of Main Continuous Variables

Variable	Model	*n*	Min	Max	*M*	*SD*	Mdn	Kurt	Skew
LOS									
	Model 1	918	1	65	5.292	4.3492	4	43.941	4.563
	Model 2	862	1	50	5.313	4.2832	4	17.142	2.943
	Total	1,780	1	65	5.302	4.3162	4	31.283	3.794
Age									
	Model 1	898	27	90	79.92	9.941	82	3.146	-1.535
	Model 2	847	24	90	79.34	10.914	82	1.792	-1.358
	Total	1,745	24	90	79.64	10.426	82	2.408	-1.447

Research Question 1

The RQ wanted to determine if there was an association between LOS and Case Management Model 1 and Case Management Model 2 for adult CHF patients in a Southwest Florida hospital system between 2020 and 2022. A Mann-Whitney U test was performed to evaluate whether LOS differed by case management models. The Mann-

Whitney U test is a nonparametric statistical test used to compare the medians of two independent groups. It is an alternative to the independent samples *t* test when the *t* test's assumptions are violated (such as non-normally distributed data and the presence of outliers). The results indicated that there was no significant difference between the LOS of Case Management Model 1 and Case Management Model 2, $z = -0.553$, $p = 0.580$.

The statistical test (Mann-Whitney U test) found no significant difference, indicating insufficient evidence to reject the null hypothesis. In other words, the LOS of patients under Case Management Model 1 was not statistically different from those under Case Management Model 2. The *z* value is the test statistic obtained from the Mann-Whitney U test, which was -0.553. This value indicates how far the sample data deviates from the null hypothesis. Because it is negative, the mean rank of LOS in Case Management Model 1 was slightly lower than that of Case Management Model 2, but not significantly so. The *p* value represents the likelihood of observing the stated results (or something more extreme) if the null hypothesis is true. In this situation, a *p* value of 0.580 indicated that if there were no difference in LOS between the two case management models, I would expect to observe these or more extreme outcomes approximately 58% of the time simply by chance. Typically, if the *p* value exceeds the chosen significance level (typically 0.05), it is considered non-significant.

In conclusion, we failed to reject the null hypothesis and conclude that Case Management Model 1 and Case Management Model 2 are not associated with differing LOS for adult CHF patients in a Southwest Florida hospital system between 2020 and 2022.

Research Question 2

RQ2 wanted to evaluate if there was a difference in the effect of case management models on LOS based on age and gender for adult CHF patients in a Southwest Florida hospital system between 2020 and 2022. A univariate analysis of variance of the GLM was performed to examine the effect of the two models on LOS, with age and gender as the controlling variables. The results indicated that the relationship between case management models and LOS was consistent across the different ages for adult CHF patients in a Southwest Florida hospital system between 2020 and 2022, $F = 1.794$, $p = 0.181$ (Table 5). The *F* value is the test statistic derived from the GLM analysis. In this situation, the value is 1.794. This value shows the ratio of between-group to within-group variation. A larger *F* value indicates more variances across groups. However, the *F* value of 1.794 was not high, implying that differences were minimal. The *p* value for the *F* test was 0.181. This *p* value represents the likelihood of seeing the obtained results if there was no association between case management models and LOS at different ages. With an *F* value of 1.794 and a *p* value of 0.181, the results showed that there was insufficient evidence to reject the null hypothesis. In other words, from 2020 to 2022, no statistically significant association was established between case management models and LOS across different age groups for adult CHF patients in a Southwest Florida hospital system.

On whether the relationship between case management models and LOS was consistent across gender groups for adult CHF patients in a Southwest Florida hospital system between 2020 and 2022, the GLM showed no significant differences, $F = 5.133$, $p = 0.261$. The *F* value of 5.133 was the test statistic generated from the GLM analysis, and

it indicates the ratio of between-group variance to within-group variability. A greater *F* value implies more significant differences between groups. The corresponding *p* value was 0.261. This *p* value represents the likelihood of seeing the results if there was no association between case management models and LOS across gender categories. A higher *p* value (more than the selected significance level, often 0.05) indicates that the results are not statistically significant. With an *F* value of 5.133 and a *p* value of 0.261, the results indicated that there was insufficient evidence to reject the null hypothesis. In other words, the relationship between case management models and LOS across gender groups for adult CHF patients in a Southwest Florida hospital system from 2020 to 2022 was not statistically significant. We therefore fail to reject the null hypothesis (see Table 5).

Table 5

Test of Between-Subjects Effects of LOS

Category	Sum of squares	*df*	Mean square	*F*	*p*	Cohen's *d*
Intercept	1179.141	1	1179.141	61.101	< .001	.161
Age	33.406	1	33.406	1.794	.181	.001
Model	.116	1	.116	.01	.936	.010
Gender	58.487	1	58.487	5.133	.261	.834
Model * gender	11.354	1	11.354	.61	.435	.000

Research Question 3

RQ3 was framed as was there an association between readmission rates and Case Management Model 1 and Case Management Model 2 for adult CHF patients in a Southwest Florida hospital system between 2020 and 2022. A chi-square test of independence was performed to evaluate the relationship between whether a patient was

readmitted or not and the two case management models. The chi-square test of independence is a statistical test used to determine if there is a significant association between two categorical variables. The variables being studied were whether a patient was readmitted or not (a binary categorical variable) and the two different case management models (a categorical variable with two categories). The relationship between these variables was not significant, χ^2 ([1, N = 1682) = .049, p = 0.824.

The test value (χ^2) was reported as 0.049. This statistic measures the difference between the observed and expected frequencies of categorical variables. Lower χ^2 values indicate a smaller difference between observed and expected values. The corresponding p value was 0.824. This p value suggested the likelihood of seeing the observed association (or something more severe) between readmission status and case management models if there was no relationship between the two variables. A higher p value (larger than the significance level, which is typically 0.05) indicates that the findings are not statistically significant. The results showed a χ^2 statistic of 0.049 and a p value of 0.824, indicating insufficient evidence to reject the null hypothesis. In other words, our research revealed no statistically significant association between whether a patient was readmitted and the two different case management models. The null hypothesis was therefore not rejected, and I concluded that Case Management Model 1 and Case Management Model 2 were not associated with differing readmission rates for adult CHF patients in a Southwest Florida hospital system between 2020 and 2022 (see Table 6).

Table 6

Cross Tabulation of Models and Readmissions

Category	Response	Total	Model 1	Model 2	*p*
Readmission?					
	No	1,463 (87.0)	800 (87.1)	663 (86.8)	.824
	Yes	21 (13.0)	118 (12.9)	101 (13.2)	

Research Question 4

RQ4 postulated answering if there was a difference in the effect of case management models on readmission rates based on age and gender for adult CHF patients in a Southwest Florida hospital system between 2020 and 2022. Using binomial logistic regression, $\alpha = .05$ (two-tailed), the impact of case management models on the readmission rates based on age and gender was investigated. The independent variables were case management models (Models 1 and 2). The dependent variable was the readmissions, categorized as yes/no. Preliminary investigations were carried out to see if the assumptions of outliers, linearity, and residual independence were met; no notable significant violations were discovered.

The logistic regression model was not statistically significant, $\chi^2(3) = 2.397$, $p = 0.494$. The model explained 0.3% of the variation in readmissions (Nagelkerke R^2) and accurately identified 87.1% of cases. There were no statistical differences in the case management models on the occurrence of readmission, controlled for age and gender, for adult CHF patients in a Southwest Florida hospital system between 2020 and 2022. The logistic regression model had a χ^2 value of 2.397, with three degrees of freedom. This statistic assesses the overall significance of the model. Logistic regression determines if

all of the predictor variables together have a significant effect on the outcome variable. The *p* value for the χ^2 statistic was 0.494. This *p* value is the likelihood of seeing the achieved model fit (or something more extreme) if the predictor variables had no connection with readmission rates. A greater *p* value (above the significance level, which is usually 0.05) indicates that the model is statistically insignificant. The model's Nagelkerke R^2 score was 0.3%, indicating its ability to explain variation in the outcome variable. This suggested that the model's predictor variables accounted for only 0.3 percent of the variation in readmission incidents. The model correctly identified 87.1% of the cases. This relates to the model's total prediction accuracy, which indicates how successfully the model classified cases into the right category (in this case, readmission rates). Based on these findings, the logistic regression model designed to predict readmission rates using the stated predictor variables (case management models, age, and gender) was not statistically significant. This indicated that, collectively, these variables did not have any significant influence on predicting readmission rates in this study. Furthermore, the model explained just a tiny fraction (0.3%) of the variation in readmission rates. Although the model had a high accuracy rate (87.1%), showing that it predicted cases rather well, its overall significance and explanatory ability for readmission rates were limited.

Table 7

Logistic Regression Output

Variable	Model	Odds ratio (OR)	95% C.I. for OR				
			Lower	Upper	*SE*	Wald	*p*
Models							.791
	Model 2		Reference				
	Model 1	.962	.720	1.285	.148	.070	
Age		.996	.982	1.009	.007	.396	.529
Gender							
	Female		Reference				.147
	Male	.807	.604	1.078	.148	2.106	
	Constant	.240			.575	6.163	.013

Summary

The goal of this quantitative study was to investigate how two case management models affected hospital LOS and readmission rates for patients with CHF within 30 days of discharge. In this study, age and gender were also considered confounding variables. The study's findings were provided in the section, which included an outline of the sample population's demographic characteristics, an analysis of statistical assumptions, and a breakdown of the statistical analysis results by research questions. The findings revealed that there was no significant difference in the LOS of Case Management Models 1 and 2. The research findings revealed no significant differences in the association between case management models and LOS across gender and age groups. A chi-square test of independence revealed that there was no statistically significant association between whether a patient was readmitted or not and the two case management models. There were no statistical differences in the case management models on the occurrence of readmission when age and gender were adjusted for.

The purpose and scope of this quantitative study will be discussed in Section 4. In Section 4, the findings will be discussed, interpreted, and summarized. The study's shortcomings will be acknowledged. The merits of the study will also be discussed in that section, along with recommendations for further research. Section 4 also discusses the implications for positive social reform, as well as the conclusion.

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

The purpose of this study was to evaluate how two case management models affect hospital LOS and readmission rates for CHF patients. Secondary data from the Southwest Florida hospital system were obtained for the study time frame of August 2020 to August 2022. Case Management Model 1 consisted of MSWs and DPAs, and Case Management Model 2 consisted of MSWs, RNs, CCs, and DPAs. I sought to answer four RQs regarding the effects of the two case management models on LOS and readmissions with the consideration of age and gender as confounding variables. The findings from this study may provide health care leaders with a better understanding of different case management models and the effects they may have on hospital LOS and readmissions.

Interpretation of the Findings

The results of this study added to the growing body of knowledge by exploring the impact a case management model has on LOS and readmissions for CHF patients. Using SPSS Version 27, I used several statistical analyses to examine the relationship between the independent variable (Case Management Model 1 and Case Management Model 2) and the two dependent variables (LOS and readmissions) with confounding variables of age and gender. RQ1 addressed whether there was an association between Case Management Model 1 and Case Management Model 2 and the LOS for CHF patients. A Mann-Whitney U test indicated there was no significant difference between LOS and the two case management models; therefore, the null hypothesis was not rejected. Although the *z* value from the Mann-Whitney U test was negative (-0.553),

meaning Case Management Model 1 had a slightly lower mean rank LOS, it was not enough to be statistically significant. Overall, Case Management Model 1 and Case Management Model 2 were not associated with differing LOS for CHF patients.

RQ2 addressed whether there was a difference in the effect of either of the two case management models on LOS based on age and gender. Using a univariate analysis of variance of the GLM, I found that the relationship between the variables was consistent across all ages. This meant that there was no statistically significant association between the case management models and LOS across all age groups for CHF patients. Using the same test for gender, I found no association between the case management models and LOS across all genders; therefore, the null hypothesis was not rejected.

RQ3 addressed whether there was an association between readmission rates and the two case management models for CHF patients. A chi-square test of independence was used to determine whether CHF patients were admitted or not within the study time time. The chi-square test was used to determine whether there was an association between two categorical variables. In this study, the test determined that there was no relationship between the variables, indicating there was no association between the two case management models and readmission rates for CHF patients. Therefore, the null hypothesis was not rejected.

RQ4 addressed whether there was a difference in readmission rates for either of the case management models based on age and gender. The binomial logistic regression test was used to investigate the impact of case management models on readmission rates,

focusing on age and gender. The test determined that there was no statistically significant difference for either of the case management model's readmission rates, accounting for the confounding variables of age and gender. Overall, there was only a small fraction (0.3%) of the variation in readmission rates for CHF patients, indicating that the variables, age and gender, had no significant influence on predicting readmissions. Therefore, the null hypothesis was not rejected.

Relevance to Donabedian's Theory

The Donabedian model was used as this study's framework to investigate the effects of different case management models on LOS and readmission rates. This theoretical framework illustrates how structure and process(s) result in outcomes (Donabedian, 2005). I evaluated whether changing the structure of a case management model had an impact on the outcomes of LOS and readmissions. The results of this study may provide health care leaders with the necessary information to make informed decisions when pursuing LOS and readmission quality improvement initiatives, making this framework the most appropriate for this study.

Limitation of the Study

This study included several limitations. Limitations are defined as factors that may impact research outcomes (P. T. Ross & Bibler Zaidi, 2019). One limitation of the study was the use of secondary data from a two-hospital health care system in Southwest Florida. Due to the specific variations in the Southwest Florida area, findings may not be applicable to other geographic areas. Specific variations include the unique population of Southwest Florida. This area is seasonal, meaning the population fluctuates from the

winter to summer months. Due to these variations, there is concern that replication of the study may not be possible, hindering the generalization of the results.

Another limitation of the study was that patients could have been readmitted to another hospital system, making the tracking of readmissions more difficult. Additionally, the secondary data for this study included only patients who were admitted to the Southwest Florida health care system in inpatient status. This may also hinder the tracking of CHF readmissions if patients were readmitted under observation status because they would not have been included in the data set for this study.

Finally, some of the data were during the COVID-19 pandemic. Hamilton et al. (2020) found that CHF admissions decreased during the pandemic because individuals were encouraged to stay home and manage their symptoms rather than going to the hospital. Although the number of CHF admissions decreased, the number of readmissions and LOS significantly increased for CHF patients during the COVID-19 pandemic (Babapoor-Farrokhran et al., 2021). This limitation could impede the trustworthiness of the current study.

Recommendations

Despite the limitations, the study provides a detailed investigation and expands on the knowledge of different case management models and their impact on LOS and readmission rates for CHF patients. However, further research is needed to determine whether a particular case management model significantly impacts LOS and readmission rates for other common hospital diagnoses such as chronic obstructive pulmonary disease, septicemia, or pneumonia (see Weiss & Jiang, 2021). Additional research should

be conducted to explore the many types of case management models nationwide and how they may impact LOS and readmission rates for common costly diagnoses. Finally, further research should be conducted to determine the expense of staffing each case management model and its effectiveness on lowering LOS and readmissions. Investigating cost was beyond the scope of the current study, but additional research could assist health care leaders in determining cost effective case management models and their possible impact on LOS and readmission rates.

The lack of difference between the two case management models in the current study could be due to high quality standards set forth by the management team. Although the case management teams comprised different disciplines, all case management team members were trained to meet the high-quality standards of care, which could explain the minimal difference between the case management models. The case management leadership did not change over the 2-year period of the study, meaning all team members of both case management models were educated similarly to meet quality metrics, no matter the discipline.

Health care administrators may use these results and apply their efforts to other primary disciplines, such as nursing or hospitalists, to assist in the reduction of LOS and readmissions. Moreover, health care leaders may take the information from this study and focus their efforts on other major departments in the hospital to assist with reducing LOS and readmissions. For example, Nair et al. (2020) found that patient education and a high ratio of hospital nursing staff has been shown to reduce readmissions. It takes a

multidisciplinary team to assist in the reduction of LOS and readmissions, and health care leaders should explore all options.

Implications for Professional Practice and Social Change

Significance to Practice

Health care leaders have placed increasing importance on LOS and readmission rates because they are a common metric used to determine hospital efficiency and quality of care (Hughes et al., 2021; OECD Data, 2023; Rachoin et al, 2020). If the metrics are not maintained, there is an increased risk that the health care system will receive less reimbursement (Rachoin et al., 2020). The current study focused on patients with primary diagnosis of CHF because it is a leading cause for hospital admissions and readmissions and is a contributing factor to long LOS (Madanat et al., 2021; Tigabe Tekle et al., 2022). Through the current study's examination of CHF LOS and readmissions in Southwest Florida, health care leaders may better understand the different case management models and how they affect LOS and readmission rates.

Significance to Social Change

Individuals with CHF endure frequent hospital admissions, are commonly difficult to discharge, have extended LOS, and are more likely to readmit (Hill, 2019; Hunt-O'Connor et al., 2021). CHF also contributes to high costs, unnecessary use of health care resources, decreased quality of life, and suboptimal patient outcomes (Harris & Popejoy, 2019; Malik et al., 2022; Urbich et al., 2020). The information gained from the current study may provide health care leaders with a better understanding of different case management models and their impact on LOS and readmission rates for CHF

patients and may allow leaders to focus on other areas to reduce LOS and readmissions, such as nursing care, physician care, and patient education. By doing so, health care leaders may decrease costs, improve patient outcomes, and increase quality of life, thereby contributing to positive social change (Urbich et al., 2020).

Conclusion

LOS and readmissions are two metrics that are often at the center of quality improvement initiatives given that poor performance contributes to excess costs (Rachoin et al., 2020). One initiative that has been found to improve LOS and readmission rates is effective discharge planning by hospital case managers (Abela et al., 2019). The primary focus for case managers is to navigate patients' complex social, physical, and psychological needs. Case management is a specialized department that has been increasingly used in hospital systems due to the large aging population and a surplus of chronic diseases (Harris & Popejoy, 2019). Hospital administrators are working to improve quality metrics, commonly focusing on LOS and readmissions. Many studies focused on LOS and readmissions, but there was a lack of research on case management models and the impact they have on LOS and readmission rates for CHF patients. The results of the current study indicated no significant difference between case management models and LOS and readmission rates for CHF patients, even when considering age and gender as confounding variables. Although the study results indicated no significant differences, the study addressed a gap in the literature and may contribute to positive social change by providing additional information to health care administrators about different case management models and their impact on LOS and readmission rates for

CHF patients, and may allow administrators to consider other variables that could positively impact LOS and readmissions for CHF patients.

References

Abela, L., Pace, A., & Buttigieg, S. C. (2019). What affects length of hospital stay? A case study from Malta. *Journal of Health Organization and Management*, *33*(6), 714–736. https://doi.org/10.1108/JHOM-10-2018-0280

Abovich, A., Matasic, D. S., Cardoso, R., Ndumele, C. E., Blumenthal, R. S., Blankstein, R., & Gulati, M. (2023, July 30). *The AHA/ACC/HFSA 2022 heart failure guidelines: Changing the focus to heart failure prevention*. American journal of preventive cardiology. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10457686/

American Heart Association. (2023, March). *What is heart failure?* https://www.heart.org/en/health-topics/heart-failure/what-is-heart-failure

American Hospital Association. (2023). *Fast facts on U.S. hospitals, 2023 - American Hospital Association*. https://www.aha.org/system/files/media/file/2023/05/Fast-Facts-on-US-Hospitals-2023.pdf

Babapoor-Farrokhran, S., Alzubi, J., Port, Z., Sooknanan, N., Ammari, Z., Al-Sarie, M., & Bozorgnia, B. (2021). *Impact of covid-19 on heart failure hospitalizations*. SN comprehensive clinical medicine. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8225402/#:~:text=Average%20length%20of%20stay%20was,19.1%25%3B%20p%20%3C%200.001

Bajorek, S. A., & McElroy, V. (2020, March 25). *Discharge planning and transitions of care*. Patient Safety Network. https://psnet.ahrq.gov/primer/discharge-planning-and-transitions-care

Beauvais, B., Whitaker, Z., Kim, F., & Anderson, B. (2022, May 12). Is the hospital value-based purchasing program associated with Reduced Hospital Readmissions? *Journal of Multidisciplinary Healthcare*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9113654/

Bisiani, M. A., & Jurgens, C. Y. (2015). Do collaborative case management models decrease hospital readmission rates among high-risk patients? *Professional Case Management*, *20*(4), 188–196. https://doi.org/10.1097/ncm.0000000000000098

Case Management Society of America. (2023, June 13). *What is a case manager? - CMSA*. https://cmsa.org/who-we-are/what-is-a-case-manager/

Chava, R., Karki, N., Ketlogetswe, K., & Ayala, T. (2019, July). Multidisciplinary rounds in prevention of 30-day readmissions and decreasing length of stay in heart failure patients: A Community Hospital based retrospective study. *Medicine (Balitmore)*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6635156/

Chazard, E., Ficheur, G., Beuscart, J.-B., & Preda, C. (2017). How to compare the length of stay of two samples of inpatients? A simulation study to compare type I and type II errors of 12 statistical tests. *Value in Health*, *20*(7), 992–998. https://doi.org/10.1016/j.jval.2017.02.009

CITI Program. (2023). *The trusted standard in research, ethics, compliance, and safety training*. https://about.citiprogram.org/

Clark, K. A. A., Reinhardt, S. W., Chouairi, F., Miller, P. E., Kay, B., Fuery, M., Guha, A., Ahmad, T., & Desai, N. R. (2022). Trends in heart failure hospitalizations in the US from 2008 to 2018. *Journal of Cardiac Failure*, *28*(2), 171–180.

https://doi.org/10.1016/j.cardfail.2021.08.020

Cleveland Clinic. (2023, March 10). *Congestive heart failure*. https://my.clevelandclinic.org/health/diseases/17069-heart-failure-understanding-heart-failure

CMS.gov. (2022, August 8). *Hospital Readmissions Reduction Program (HRRP)*. https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/HRRP/Hospital-Readmission-Reduction-Program

CMS.gov. (2023a). *Acute inpatient PPS*. https://www.cms.gov/medicare/medicare-fee-for-service-payment/acuteinpatientpps#:~:text=Section%201886(d)%20of%20the,prospective%20payment%20system%20(IPPS)

CMS.gov. (2023b). *CMS Glossary*. https://www.cms.gov/glossaryCollier County Public Services. (2023). *Senior Citizens Nutrition & Activity Program*. https://www.colliercountyfl.gov/government/public-services/divisions/community-and-human-services-division/services-for-seniors-program/senior-citizens-nutrition-activity-program?locale=en

Data USA. (n.d.). *Naples, FL*. https://datausa.io/profile/geo/naples-fl

Donabedian, A. (1968). The evaluation of medical care programs. *Bulletin of the New York Academy of Medicine*, *44*(2), 117-124. https://www-ncbi-nlm-nihgov.ezp.waldenulibrary.org/pmc/articles/PMC1750027/?page=2

Donabedian, A. (2005). Evaluating the quality of medical care. *Milbank Quarterly*, *83*(4),

691–729. https://doi.org/10.1111/j.1468-0009.2005.00397.x

Ferguson, T., & Quigley-Stickney, J. (2023, April 24). *Resolving the healthcare staffing shortage: New Models for Case Management Practice*. Case Management Society of America. https://cmsatoday.com/2023/04/24/resolving-the-healthcare-staffing-shortage-new-models-for-case-management-practice/

Flannelly, K. J., Flannellly, L. T., & Jankowski, K. B. (2018). Threats to internal validity of experimental and quasi-experimental research in healthcare. *Journal of Health Care Chaplaincy*, 24, 107-130. https://doi.org/10.1080/08854726.2017.142101

Frost, J. (2020). Hypothesis testing: An intuitive guide for making data driven decisions. Statistics by Jim, 10-33. https://pdfcoffee.com/frost-j-hypothesis-testing-anintuitive-guide-to-make-data-pdf-free.html

Gao, Q., Ahn, M., & Zhu, H. (2015). Cook's distance measures for varying coefficient models with functional responses. *Technometrics: a journal of statistics for the physical, chemical, and engineering sciences, 57*(2), 268–280. https://doi.org/10.1080/00401706.2014.914978

Giardino, A. P., & De Jesus, O. (2023, January). *Case management*. StatPearls. https://www.ncbi.nlm.nih.gov/books/NBK562214/

Hamilton, B., Yadav, C., Gomez, D., Book, K. A., Motavalli, L., Gronczewski, C., Kempf, S., Giordano, N., & Mastro, K. A. (2022, April 1). *Heart failure readmission reductions during the COVID-19 pandemic*. Nursing management. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8986526/

Harris, R. C., & Popejoy, L. L. (2019). Case Management: An Evolving Role. *Western*

Journal of Nursing Research, *41*(1), 3–5. https://doi.org/10.1177/0193945918797601

Heidenreich, P. A., Fongrow, G. C., Opsha, Y., Sandhu, A. T., Sweitzer, N. K., & Warraich, H. J. (2022, March). *Economic issues in heart failure in the United States*. Journal of Cardiac Failure. https://www.sciencedirect.com/science/article/pii/S107191642200001X

Hill, L. (2019). Producing an effective care plan in Advanced Heart Failure. *European Heart Journal Supplements*, *21*(Supplement_M), M61–M63. https://doi.org/10.1093/eurheartj/suz213

Hudon, C., & Kessler, R. (2023). Integrating case management for patients with complex needs in the ground practice: The importance of context in evaluative designs. *Health Research Policy and Systems*, *21*(1). https://doi.org/10.1186/s12961-023-00960-4

Hughes, A., Horrocks, D., Leung, C., Richardson, M., Sheehy, A., & Locke, C. (2021, September 9). *The increasing impact of length of stay "outliers" on length of stay at an urban academic hospital*. BMC Health Services Research. https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-021-06972-6

Hunt-O'Connor, C., Moore, Z., Patton, D., Nugent, L., Avsar, P., & O'Connor, T. (2021, June). *The effect of discharge planning on length of stay and readmission rates of older adults in acute hospitals: A systematic review and meta-analysis of Systematic Reviews*. Journal of nursing management.

https://pubmed.ncbi.nlm.nih.gov/34216502/

Huntley, A. L., Johnson, R., King, A., Morris, R. W., & Purdy, S. (2016). Does case management for patients with heart failure based in the community reduce unplanned hospital admissions? A systematic review and meta-analysis. *BMJ Open*, *6*(5). https://doi.org/10.1136/bmjopen-2015-010933

IBM. (2023). *IBM SPSS software*. https://www.ibm.com/spss

Jung, A., Balzer, J., Braun, T., & Luedtke, K. (2022). Identification of tools used to assess the external validity of randomized controlled trials in reviews: A systematic review of measurement properties. *BMC Medical Research Methodology*, *22*(1). https://doi.org/10.1186/s12874-022-01561-5

Khan, M. S., Sreenivasan, J., Lateef, N., Abougergi, M. S., Greene, S. J., Ahmad, T., Anker, S. D., Fonarow, G. C., & Butler, J. (2021). Trends in 30- and 90-day readmission rates for heart failure. *Circulation: Heart Failure*, *14*(4). https://doi.org/10.1161/circheartfailure.121.008335

Kim H. Y. (2013). Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. *Restorative dentistry & endodontics*, *38*(1), 52–54. https://doi.org/10.5395/rde.2013.38.1.52

Klaehn, A.-K., Jaschke, J., Freigang, F., & Arnold, M. (2022). Cost-effectiveness of case management: A systematic review. *The American Journal of Managed Care*, *28*(7). https://doi.org/10.37765/ajmc.2022.89186

Liu, Y., & Eicher-Miller, H. A. (2021, March 27). *Food insecurity and cardiovascular disease risk*. Current atherosclerosis reports.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8000689/

Madanat, L., Saleh, M., Maraskine, M., Halalau, A., & Bukovec, F. (2021). Congestive heart failure 30-day readmission: Descriptive Study of Demographics, co-morbidities, heart failure knowledge, and self-care. *Cureus*. https://doi.org/10.7759/cureus.18661

Malik, A., Brito, D., Vaqar, S., & Chhabra, L. (2022). Congestive Heart Failure. *StatPearls*. https://www.ncbi.nlm.nih.gov/books/NBK430873/

Mayo Foundation for Medical Education and Research. (2023, April 20). *Heart failure*. Mayo Clinic. Retrieved September 24, 2022, from https://www.mayoclinic.org/diseases-conditions/heart-failure/symptoms-causes/syc-20373142

McCants, K. M., Reid, K. B., Williams, I., Miller, D. E., Rubin, R., & Dutton, S. (2019). *The Impact of Case Management on Reducing Readmission for Patients Diagnosed With Heart Failure and Diabetes*. Professional Case Management . https://nursing.ceconnection.com/ovidfiles/01269241-201907000-00002.pdf

McHugh M. L. (2013). The chi-square test of independence. *Biochemia medica, 23*(2), 143–149. https://doi.org/10.11613/bm.2013.018

McLaughlin-Davis, M. (2019). The practice of hospital case management: A White Paper—hospital case management: Past, present and future. *Professional Case Management, 24*(6), 280–296. https://doi.org/10.1097/ncm.0000000000000403

Mcleod, S. (2023a, July 31). *What does effect size tell you?*. Simply Psychology. https://www.simplypsychology.org/effect-

size.html#:~:text=Cohen%20suggested%20that%20d%20%3D%200.2,if%20it%20is%20statistically%20significant.

Mcleod, S. (2023b, September 25). *P-value and statistical significance: What it is & why it matters*. Simply Psychology. https://www.simplypsychology.org/p-value.html

Mishra, P., Pandey, C. M., Singh, U., Gupta, A., Sahu, C., & Keshri, A. (2019). Descriptive statistics and normality tests for statistical data. *Annals of cardiac anaesthesia, 22*(1), 67–72. https://doi.org/10.4103/aca.ACA_157_18

Nair, R., Lak, H., Hasan, S., Gunasekaran, D., Babar, A., & Gopalakrishna, K. V. (2020). Reducing all-cause 30-day hospital readmissions for patients presenting with acute heart failure exacerbations: A Quality Improvement initiative. *Cureus*, *12*(3). https://doi.org/10.7759/cureus.7420

NCH Healthcare System. (2023). *About NCH*. https://nchmd.org/about-us/

NCH Revenue Cycle. (2023). [CHF LOS and readmissions for August 2020-August 2022] [Unpublished raw data]. NCH Healthcare System.

OECD Data. (2023). *Length of hospital stay*. https://data.oecd.org/healthcare/length-of-hospital-stay.htm#indicator-chart

Ohlund, B., & Yu, C. (n.d.). Threats to validity of Research Design. https://web.pdx.edu/~stipakb/download/PA555/ResearchDesign.html

Patel, J. (2021). Heart failure population health considerations. *The American Journal of Managed Care*, *27*(9). https://doi.org/10.37765/ajmc.2021.88673

Patel, P. R., & Bechmann, S. (2023, April 3). *Discharge Planning*. National Library of Medicine. https://www.ncbi.nlm.nih.gov/books/NBK557819/

Rachoin, J.-S., Aplin, K. S., Gandhi, S., Kupersmith, E., & Cerceo, E. (2020, September). *Impact of length of stay on readmission in hospitalized patients*. Cureus. https://pubmed.ncbi.nlm.nih.gov/33005555/

Rehman, Z. U., Siddiqui, A. K., Karim, M., Majeed, H., & Hashim, M. (2019, August 8). *Medication non-adherence among patients with heart failure*. Cureus. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6779150/#:~:text=Poor%20adherence%20or%20non%2Dadherence,physical%20function%2C%20and%20even%20death.

Ross, P. T., & Bibler Zaidi, N. L. (2019, August). *Limited by our limitations*. Perspectives on medical education. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6684501/

Ross, S. M. (2018, August 23). *Creating a seamless discharge planning process*. Creating a Seamless Discharge Planning Process. https://blog.cureatr.com/creating-a-seamless-discharge-planning-process#:~:text=%E2%80%9CSeamless%E2%80%9D%20discharge%20planning%20happens%20when,the%20hospital%20to%20the%20home.

Savista. (2023). Job Descriptions.

Sax, D. R., Mark, D. G., Rana, J. S., Reed, M. E., Lindenfeld, J., Stevenson, L. W., Storrow, A. B., Butler, J., Pang, P. S., & Collins, S. P. (2022). Current emergency department disposition of patients with acute heart failure: An opportunity for improvement. *Journal of Cardiac Failure*, *28*(10), 1545–1559. https://doi.org/10.1016/j.cardfail.2022.05.006

Schober, P., & Vetter, T. R. (2020, December). Nonparametric Statistical Methods in Medical Research. https://www.researchgate.net/publication/346908430_Nonparametric_Statistical_Methods_in_Medical_Research

Serdar, C. C., Cihan, M., Yücel, D., & Serdar, M. A. (2021). Sample size, power and effect size revisited: Simplified and practical approaches in pre-clinical, clinical and laboratory studies. *Biochemia Medica*, *31*(1), 27–53. https://doi.org/10.11613/bm.2021.010502

Shabani, F., Shahboulaghi, F. M., Nayeri, N. D., Hosseini, M., Maleki, M., Naderi, N., & Chehrazi, M. (2021). Optimization of Heart Failure Patients Discharge Plan in Rajaie Cardiovascular Medical and Research Center: An Action Research. *International Journal of Community Based Nursing and Midwifery*, *9*(3), 199–214. https://doi.org/10.30476/ijcbnm.2021.87770.1461

Shah, B., Forsythe, L., & Murray, C. (2018). Effectiveness of Interprofessional Care Teams on Reducing Hospital Readmissions in Patients with Heart Failure: A Systematic Review. *Medsurg Nursing, 27*(3), 177-185. https://www.proquest.com/scholarly-journals/effectiveness-interprofessional-care-teams-on/docview/2062944422/se-2

Siddique, S. M., Tipton, K., Leas, B., Greysen, S. R., Mull, N. K., Lane-Fall, M., McShea, K., & Tsou, A. Y. (2021). Interventions to reduce hospital length of stay in high-risk populations. *JAMA Network Open*, *4*(9). https://doi.org/10.1001/jamanetworkopen.2021.25846

Skelly, A., Dettori, J., & Brodt, E. (2012). *Assessing bias: The importance of considering confounding* . Evidence Based Spine Care Journal. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3503514/

Stone, K., Zwiggelaar, R., Jones, P., & Mac Parthaláin, N. (2022). A systematic review of the prediction of hospital length of stay: Towards a unified framework. *PLOS Digital Health*, *1*(4). https://doi.org/10.1371/journal.pdig.0000017

Sundjaja, J., Shrestha, R., & Krishan, K. (2023). *McNemar and Mann-Whitney U tests - statpearls - NCBI bookshelf*. National Library of Medicine. https://www.ncbi.nlm.nih.gov/books/NBK560699/

10 Surprising Statistics on Snowbirds in Florida for 2023. (2023, January 19). *Real estate news*. https://www.floridarealtymarketplace.com/blog/10-surprising-statistics-on-snowbirds-in-florida-for-2023.html

Theofanidis, D., & Fountouki, A., (2019). Limitations And Delimitations In The Research Process. *Perioperative Nursing (GORNA), E-ISSN:2241-3634*, *7*(3), 155–162. http://doi.org/10.5281/zenodo.2552022

Tigabe Tekle, M., Bekalu, A. F., & Tefera, Y. G. (2022). Length of hospital stay and associated factors among heart failure patients admitted to the University Hospital in Northwest Ethiopia. *PLOS ONE*, *17*(7). https://doi.org/10.1371/journal.pone.0270809

Tipton, K., Leas, B. F., & Mull, N. K. (2021, September). *Interventions to decrease hospital length of stay*. National Center for Biotechnology Information. https://pubmed.ncbi.nlm.nih.gov/34644039/

Turhan, N. (2020). *Karl Pearson's chi-square tests*. Educational Research and Reviews. https://files.eric.ed.gov/fulltext/EJ1267545.pdf

Turner, S. L., Forbes, A. B., Karahalios, A., Taljaard, M., & McKenzie, J. E. (2021). Evaluation of statistical methods used in the analysis of interrupted time series studies: a simulation study. *BMC medical research methodology, 21*(1), 181. https://doi.org/10.1186/s12874-021-01364-0

Upadhyay, S., Stephenson, A. L., & Smith, D. G. (2019). Readmission rates and their impact on hospital financial performance: A study of Washington hospitals. Journal of Healthcare Organization, Provision, & Financing, 56, 1-10. https://doi.org/10.1177/0046958019860386

Urbich, M., Globe, G., Pantiri, K., Heisen, M., Bennison, C., Wirtz, H. S., & Di Tanna, G. L. (2020). A systematic review of medical costs associated with heart failure in the USA (2014–2020). *PharmacoEconomics, 38*(11), 1219–1236. https://doi.org/10.1007/s40273-020-00952-0

U.S. Department of Health and Human Services. (2022, October 25). *Methods for De-identification of PHI*. https://www.hhs.gov/hipaa/for-professionals/privacy/special-topics/de-identification/index.html#guidancedetermination

Wang, S. Y., Valero-Elizondo, J., Ali, H., Pandey, A., Cainzos-Achirica, M., Krumholz, H. M., Nasir, K., & Khera, R. (2021). Out-of-Pocket Annual Health Expenditures and Financial Toxicity From Healthcare Costs in Patients With Heart Failure in the United States. *Journal of the American Heart Association, 10*(14).

https://doi.org/10.1161/jaha.121.022164

Wang, Y., Rodríguez de Gil, P., Chen, Y. H., Kromrey, J. D., Kim, E. S., Pham, T., Nguyen, D., & Romano, J. L. (2017). Comparing the performance of approaches for testing the homogeneity of variance assumption in one-factor anova models. *Educational and psychological measurement, 77*(2), 305–329. https://doi.org/10.1177/0013164416645162

Ward, C., & Patel, V. (2021, March 10). *A Case-Control Study of Length of Stay Outliers*. AJMC. https://www.ajmc.com/view/a-case-control-study-of-length-of-stay-outliers

Weiss, A. J., & Jiang, H. J. (2021, July). *Agency for Healthcare Research and Quality*. Overview of Clinical Conditions With Frequent and Costly Hospital Readmissions by Payer, 2018 #278. https://hcup-us.ahrq.gov/reports/statbriefs/sb278-Conditions-Frequent-Readmissions-By-Payer-2018.jsp

Yakusheva, O., & Hoffman, G. J. (2020). Does a reduction in readmissions result in net savings for most hospitals? An examination of Medicare's Hospital Readmissions Reduction Program. *Medical Care Research & Review, 77*(4), 334-344. https://doi.org/10.1177/1077558718795745

Zilberberg, M. D., Nathanson, B. H., Sulham, K., Mohr, J. F., Goodwin, M. M., & Shorr, A. F. (2023). Descriptive Epidemiology and Outcomes of Patients with Short Stay Hospitalizations for the Treatment of Congestive Heart Failure in the US. *ClinicoEconomics and Outcomes Research*, *15*, 139–149.

https://doi.org/10.2147/ceor.s400882