**Review Article**

**Characteristics Associated with Heart Failure Patients and Their Caregivers: Predictors of Readmission Rates**

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**Introduction**

Congestive Heart Failure (CHF) is a common disease of older adults with a survival rate that rivals many forms of cancer [1]. This disease affects 1 in 100 individuals over the age of 65, or approximately 5.3 million individuals in the United States [2]. CHF is the underlying cause of more than 56,000 deaths and is the primary diagnosis in nearly 1 million patients who are hospitalized [3]. The 30 day hospital readmission rate for CHF patients is, on average, 28% in the United States [4]. With these statistics as well as the age of baby boomers, it is not surprising that CHF make up a vast majority of readmissions diagnosis to the hospital.

The estimated cost of 30-day readmissions for all diagnoses in Medicare beneficiaries is in excess of one billion dollars each year [3]. With the advent of pay for performance, the Centers of Medicare and Medicaid Services (CMMS) are imposing financial penalties on hospitals for high 30-day readmission rates for specific diagnoses, with CHF being one of them [5]. In order to minimize CHF 30-day readmissions clinicians must utilize real time decision-making strategies to pinpoint high-risk patients and intervene appropriately.

Research has shown that patient characteristics play a pivotal role in CHF readmissions, yet less is known about the impact of caregiver characteristics on re-admission rates. In terms of the patient, evidence suggests a strong association between congestive heart failure and cognitive impairment [5]. Individuals with CHF have poorer attention, memory, and executive function, and impairments in processing speed which can be associated with poorer self-care resulting in increased readmission [5].

Moreover, a patient’s physical functioning has been shown to be directly related to the caregiver’s depressive symptoms or emotional distress [2]. As the complexity of the disease affects the patient, their caregiver will need to assume greater responsibility for heart failure related tasks. This includes symptom assessment, medication management, activities of daily living (bathing, eating, preparing meals), and providing emotional support even though the caregiver often lacks formal training to handle the complexity of these tasks [6]. Thus, it is critical to have a better understanding of factors that impact a caregiver’s ability to provide and or supervise the care needed at home in order to avoid or minimize 30-day readmission rates for CHF.

**Keywords:** Caregiver strain; Cognitive impairment; Readmission rates; Congestive heart failure readmission; Nurse practitioners; Doctors/ physicians; Depression

**Review of the Literature**

**Congestive Heart Failure and Readmission**

Congestive heart failure requires complex care and strict adherence to post-discharge directives. Adherence to treatment is defined as the proper and regular use of medications, low sodium diet, physical exercise, preventative care, self-monitoring of signs and symptoms of congestive heart failure and contacting a health care professional immediately if signs of de-compensation develop [7]. Although prediction of a 30-day CHF readmission rate in the clinical setting has been difficult and complex, research findings suggest some risk factors. For example, research indicates that readmissions are higher in males (60.7%), Caucasians (66.7%) and those discharged home (44.6%) with home health care [3]. Non-modifiable predictors are age (average age 65-69) (31.8%), single (27.5%), and with comorbidities such as renal failure/insufficiency (28.6%) [7], and depression. Modifiable risk factors include lack of discharge teaching related to heart failure (38.9%) and smoking cessation (38.9%) [8], as well as fragmented health care services with insufficient coordination and communication between patients and providers [6].

Relationships and marital status can be protective factors in all re-admission rates. Patients often report their caregivers provide high levels of practical support (82%), emotional support (87%) and attention to CHF symptoms (95%) [9]. Higher perceived social support also is associated with lower readmission rates and better self-care behaviors including improved medication, dietary adherence and daily weighing [10]. Social isolation (either because of being single or lacking a strong social support network) predicts a 36% increase in mortality [11].

Self-surveys also show that compliance to congestive heart failure guidelines have a strong correlation (r= 0.355, p= 0.001) with readmission rates [7]. The rate of readmission for those who never weigh themselves is 41.5% while the rate for those patients who forget to take prescribed medications is 43.9% [7]. Salt intake also played a crucial role. The majority of readmitted patients do not eat the recommended foods, such as those low and/or free of salt and thus are readmitted to the hospital. In fact, only 7.3% of patients follow the current low salt/sodium recommendations [7].

**Cognitive Impairment**

Cognitive impairment is defined as a decline in cognition beyond the normal variations expected for a person’s age and education level and is thought to be a result of inadequate cerebral perfusion or hypoxic brain injury [10]. Cognitive impairment, including difficulty with memory, learning, concentration and decision-making, are important to identify because it may make an individual with CHF vulnerable to readmission and poor outcomes [5]. Assessing for cognitive impairment is crucial since it is the greatest predictor of decline. Cognitive impairment is believed to be the most influential factor and greatest predictor in the development of skills and knowledge [7] that is needed to manage the disease and its associated symptoms. According to Agarwal [5], fewer than 9% of patients with CHF were screened for cognitive impairment or recognized by a provider or healthcare team as having cognitive impairment. This means that the majority of patients were not properly identified and/or screened for cognitive impairment by the clinicians providing their medical care even though, cognitive impairment is the greatest predictor for overall decline.

According to Agarwal [5] patients with both heart failure and cognitive impairment have a higher readmission rate than those with cognitive impairment alone. In this study, patients (those with heart failure and those without) were given the Mini Cog examination 48 hours or less before discharge and at readmissions within 30 days of discharge, reporting a mini cog score of less than 4 (indicating cognitive impairment). The study demonstrated that individuals with heart failure and cognitive impairment had significantly higher 30-day readmission rate (26.8%) than patients with just cognitive impairment alone (13.3%, p= 0.01) [5]. Cognitive impairment could interfere with a patients’ ability to carry out steps needed to monitor and manage CHF symptoms as part of a self-care regimen [10]. Congestive heart failure self-care is considered a naturalistic decision-making process composed of lifestyle choices that can contribute to maintaining physiological stability, daily monitoring of symptoms for change, and responding to symptoms when they occur [10]. Thus, it is imperative that the patient is fully aware of the disease and its treatment guidelines. Impaired cognitive abilities may be related to a significant increase in congestive heart failure illness and associated in-hospital mortality [5].

**Risk Factors for Caregivers of Congestive Heart Failure Patients**

A caregiver is defined as whomever a patient identifies as providing them with assistance and support [11], and is often an unpaid relative [12]. On average, caregivers will spend 16 hours per week caring for the CHF patient, which is more time than any other heart disease illness [13]. Caregivers play a pivotal role as the disease progresses and the patient experiences greater disability. According to Chung, et al. [2], 21% of all CHF readmissions are the direct result of inadequate social support by a caregiver.

Based on a review by Grant and Graven [6], the majority of CHF caregivers are female (78.9%), spouse (68.4%), over 79 years of age (37%), living with the care recipient (83%), and have been an active caregiver for an average of one to five years (40%). The quality of the relationship also has a bearing on the patient. For example, high marital quality has been found to improve eight-year survival in patients with CHF significantly [12].

Social support for CHF persons is believed to be beneficial for several reasons. The receipt of support probably improves adaptation by providing solutions, promoting adherence to health behaviors, and by tranquilizing the neuroendocrine system to be less reactive to stress [11]. Social support and shared decision making can also enhance heart failure self-confidence [11].

**Caregiver Cognitive Impairment**

Research related to cognitive impairment in the caregiver themselves is limited. However, there is research to suggest that caregivers of spouses who experience dementia have a sixfold increase in the development of dementia themselves. Dementia caregivers have greater cognitive impairment compared to non-dementia caregivers because of not only the distress caused by caring for the patient but also the neuropathological disease process [14]. The study suggests that the effects of stress may increase the risk of negative cognitive outcomes since stress can impair the hippocampus, the brain region for memory, and thus cause dementia. The chronic stress experienced by some dementia caregivers can accelerated frailty and cognitive decline and mental processing speed [14]. Research has suggested that chronic stress does affect not only mood but also cognitive function in animal studies [15]. In addition, the Nurse Health Study showed that female caregivers of ill spouses performed worse than others on a general cognitive screening test and functioning.

**Caregiver Strain**

Family caregivers may experience significant psychological distress as a direct result of caring for a loved one with CHF [2]. Informal caregiving and support for patients with CHF can negatively affect the caregivers’ well-being and consequently affect the health and well-being of the CHF care recipients [12]. The patient/caregiver relationship is a reciprocal partnership. Strong social support is associated with better cardiovascular outcomes due to better medication compliance, encouragement of self-care behaviors such as symptom monitoring and lifestyle changes [9] and an increased eight-year survival rate [12]. Greater caregiver burden though is associated with worse physical function of the CHF care recipient [12]. Moreover, caregivers who experience caregiver strain are more likely to die at a younger age compared to those with no strain [6]. The chronic stress that the caregiver experiences can lead to psychological distress, economic and social problems, disruption of family relationships and the sense of losing control [13,16]. One in three family caregivers perceived moderate to severe difficulty managing behavioral problems related to moodiness and irritability of the CHF patient [13].

Caregiver’s depression can increase when the CHF patient has an increase in the need for care due. This may be due to the more complex physical symptoms which worsens the caregivers’ cognitive impairment [12]. Caregivers often have a strong emotional bond to the care recipient that can overshadow the caregiver’s own needs. Family caregivers often do not seek medical attention for their own health needs because their attention is focused on the CHF patient, which in turn further increases caregiver burnout of strain [2]. In fact, 39% of caregivers have at least one chronic illness [11] and the poorer the health of the caregiver the greater the associated burden [12]. Dealing with a patient’s behavior problems, having less time for activities with friends, and less control over the health outcomes of the care recipient [12] are identified risks for increased caregiver strain. The length of time associated with the care is also a major factor. Caregivers who have spent more than one year in the caregiver role had higher burden strain that those who did so for a shorter period [17].

Caregiving can be influenced by prior experiences and past relationships (positive or negative). These factors can influence the caregiver’s willingness to provide assistance to the care recipient [11]. According to Chung, et al. [2] mild to moderate depressive symptoms were common with 23 to 47% of spousal caregivers of patients with CHF. Additionally, 45% of family caregivers who took care of end-stage CHF care recipients had some depressive symptoms [2]. The majority of caregivers (62%) also report that their life has been negatively changed due to their caregiving role [13].

Chung, et al. [13] noted it is imperative to identify and screen for depressive symptoms of caregivers before they reach burnout in order to provide optimal quality of care-to-care recipients with CHF as well as the prevention of poor health outcomes of the caregiver. Caregivers who had depressive symptoms had a decrease in functional status, lower perceived control, more severe caregiver burden, greater difficulty in caregiving, and spent more time on caregiver tasks than those caregivers who did not suffer from depression [18].

**Objectives**

The purpose of this study was to investigate characteristics of congestive heart failure patients and their designated caregivers that might predict 30-day re-admission rates. While previous research has explored cognitive impairment of CHF patients, little research has been conducted on the caregivers’ cognitive status or their level of strain as a predictive factor for readmission rates.

This study examined the current cognitive levels of congestive heart failure patients as well as the cognitive level and extent of caregiver strain. If cognitive impairment and caregiver burden are identified as contributing to a 30-day readmission, intervention strategies can be developed that healthcare providers can utilize to reduce the risk of re-admission within 30-days of discharge.

**Methods**

**Design**

This was a correlational, cross sectional, non-experimental design study.

**Sample and Setting**

A convenience sample of CHF patients and caregivers were recruited from two cardiology inpatient units of a large urban hospital in the mid-west. This is a state-of-the-art, 877-bed tertiary care teaching hospital with a strong focus on research. The hospital is recognized for clinical excellence in the fields of cardiology and cardiovascular surgery. The units can admit a total of sixty-two patients between them. The units manage the care of patients with a variety of cardiac diagnoses such as heart failure, angina, atrial fibrillation, chest pain, endocarditis, cardiomyopathy, and hypertension. Length of stays and readmission rates vary based on primary admitting diagnosis as well as comorbidities. During the data collection the average length of stay for patients on both units was 3.5 days and the rate of 30-day readmissions was 62%.

The inclusion criteria for the study were: (1) person diagnosed with CHF; (2) over the age of 18 (3) has a designated primary caregiver; (4) both patient and caregiver agreed to participate in the study; (5) both patient and caregiver were able to read and understand English; and (6) re-admitted within 30 days with diagnosis of CHF. The exclusion criteria were: (1) non-English speaking patients: (2) severe neurological impairment that would inhibit them from following directions or communicating with the investigator or caregiver: or (3) under hospice care. Thirty-nine persons with a diagnosis of CHF were recruited and 21 caregivers agreed to participate. All patients in the study did have a confirmed readmission within 30 days related to heart failure. In addition, not all caregivers in this study provided direct care to the CHF patients.

**Readmission Rates**

Readmission rate was defined as a person admitted to the hospital with a primary diagnosis of CHF who had been hospitalized within the last thirty days with the same primary diagnosis. Readmission rates for the two inpatient unit were obtained from the unit manager and clinical coordinator. All patients in the study did have a confirmed 30-day readmission related to heart failure.

**Instruments**

Cognitive status and depression were the two outcome variables measured in both the CHF patient and their caregiver. In addition, caregivers completed a caregiver burden survey. Both completed a demographic information form.

**Cognitive Status**

Cognitive status was measured using the Mini-Cog. The Mini-Cog is a simplified bedside clinical examination that takes the clinician approximately 3 minutes to complete and consists of a 3-item short-term memory task and executive function task (clock-drawing test). Scoring is based on word recall (0-3 points) and clock drawing (0 or 2 points) for a total of five points. Scores of 3, 4 and 5 indicates a lower likelihood of dementia; whereas, scores of 0, 1, and 2 indicate cognitive impairment. The Mini-Cog has a sensitivity of 76-99% and specificity of 89-93% with an overall confidence interval of 95%, thus making it a quick and effective tool for the screening of cognitive impairment.

**Depression**

Depression was measured using the Patient Health Questionnaire 9 (PHQ-9), a multipurpose instrument used for screening, monitoring and measuring the severity of depression. The PHQ-9 is a self-rating instrument that consists of nine items designed to correspond to the Diagnostic and Statistical Manual of Mental Disorder (DSM-IV) diagnostic criteria for major depressive disorders. The tool rates the frequency of symptoms as well as screens for the presence and duration of suicidal ideations. Respondents rate the scaled items from 0 to 3 (not at all, several days, more than half the days, or nearly all the days) according to their frequency of personal experience over a previous 2-week period. Scores range from 0 to 27 with higher scores indicating greater levels of depression. Scores above ten indicate depression. The scale scoring key is as follows: 1-4 minimal depression, 5-9 mild depression, 10-14 moderate depression, 15-19 moderately severe depression and 20-27 severe depression. The scale has an overall sensitivity and specificity of 88% for major depression.

**Caregiver Strain**

Caregiver strain was measured using the Caregiver Burden Scale (CBS). The CBS was developed in 1980 as a self-report scale that was aimed at assessing the subjective burden experienced by an informal (unpaid) caregiver [19]. The total burden index is the mean of all 22 items. Responses are scored on a scale from 1 (not at all) to 4 (often), and the higher the score the greater the burden [17]. Scores range from 22 – 88. The scoring key is as follows: 0-20 little or no burden, 21-40 mild to moderate burden, 41-60 moderate to severe burden and 61-88 severe burden. It is composed of five indexes which include general strain (lack of personal freedom), isolation (limited social interactions and private time), disappointment (loneliness, physical burden, financial impact, and life being unfair), emotional involvement (embarrassment, hurt and anger due to the patient’s behavior), environment (concerning partners’ experiences of not being able to handle practical problems related to care of the patient) [12].

**Demographic Form**

The demographic information form was developed specifically for this study by the investigator. The demographic questions included age, gender, race, marital status, number of children, education level, use of tobacco and or alcohol, comorbidities, and length of time having heart failure. In addition, questions related to number of times heart failure medications have been missed, number of hospitalizations related to heart failure, and questions related to knowledge of heart failure and associated symptoms were asked.

**Data Collection**

Data were collected on two inpatient cardiology units at a large urban hospital. The subjects were recruited with the assistance of the clinical manager and nursing staff. Four informational meeting for both the morning and midnight staff were conducted, outlining the inclusion/exclusion requirements for the study. A flyer was given to the attendees outlining the specifics of the study, the tools being used as well as the inclusion/exclusion criteria. In addition, the investigator met with the charge nurse each day of possible data collection to obtain a list of patients who met the inclusion criteria. Once patients and their caregivers were identified, the investigator obtained informed consent before data were collected. Patient medication lists, co-morbidities and re-admission data were obtained directly from their medical record through the use of Epic.

**Protection of Human Subjects**

University Institutional Review Board approval was obtained prior to recruitment and data collection. In addition, written informed consent was obtained from each eligible participant after explaining the study’s purpose, significance and procedures. The participants volunteered to participate, and their responses were anonymous. Participants were free to refuse to respond to any question that may result in psychological distress. A number for a crisis hotline was provided to those who verbalized being distressed, however none of the patient or caregivers required the information.

**Data Analysis**

The data were analyzed using SPSS version 27. Basic descriptive statistics were performed on all study variables. Independent t-test and chi-square were conducted to compare differences between CHF patients and their caregivers on interval and categorical level data. Statistical significance was set a priori at p<.05. Variables are reported as means and standard deviations.

**Results**

**Sample**

A total of 39 CHF patients and 21 caregivers were recruited for the study. Some of the caregivers recruited for the study were not directly related to those CHF patients in the study. The majority of CHF participants were African American, female, married, with an average age of 65 years old. Patients reported an average of 5 years with a diagnosis of congestive heart failure and all reported other co morbidities, including hypertension, renal disease, diabetes, and coronary artery disease. The medications included antihypertensives, anti-platelets, beta blockers and ace inhibitors.

**CHF Patients**

**Demographic Findings**

Self-reporting personal knowledge and symptom management of CHF was reported as high. Patients reported that 64 % of the time they were able to self-manage heart failure symptoms and had adequate knowledge of heart failure (66%). Moreover, they reported that, on average, they never forgot to take their medications. The patients also reported they are readmitted for congestive heart failure infrequently with an average of once time in a year (51%) Patients identified themselves as having the most responsibility for managing their congestive heart failure compared to their caregivers or their physician (Table 1,2).

|  |  |  |
| --- | --- | --- |
| **Component** |  | **% (N)** |
| Gender | Male | (19) 49% |
|  | Female | (20) 51% |
| Race | African American | (21) 53% |
|  | Asian | (1) 2.6% |
|  | Caucasian | (15) 38.5% |
|  | Other | (2) 5.1% |
| Marital Status | Single | (14)35.9% |
|  | Married | (23) 59% |
|  | Divorce | (2) 5.1% |
| Number of Children | 0 | (3) 7.7% |
|  | 1 | (11) 28.2% |
|  | 2 | (9) 23.1% |
|  | 3 | (8) 20.5% |
|  | 4 | (6) 15.4% |
|  | 5 | (1) 2.6% |
|  | 6 | (1)2.6% |
| Education Level | Less than high school | (7) 17.9% |
|  | High School or GED | (16) 41% |
|  | Some College or technical School | (9) 23.1% |
|  | College Graduate of technical school graduate | (6) 15.4% |
|  | Advanced Degree | (1) 2.6% |
| Primary Care Physician | Yes | (36) 92.3% |
|  | No | (3) 7.7% |
| Smoking | Yes | (7) 17.9% |
|  | No | (32) 82.1% |
| Alcohol Use | Yes | (4) 10.3% |
|  | No | (33) 84.6% |
| Caregiver Smoking | Yes | (4) 10.3% |
|  | No | (35) 89.7% |
| Medical Conditions | Yes | (39) 100% |
|  | No | (0) 0% |
| Insurance | Yes | (26) 92.3% |
|  | No | (3) 7.7% |
| Forgetting Prescribed Medications | Never | (28) 71.8% |
|  | 01-Feb | (8) 20.5% |
|  | 03-May | (3) 7.7% |
|  | More than 6 times | (0) 0% |
| Heart Failure Hospitalizations | 0 | (3) 7.7% |
|  | 0-1 | (20) 51.3% |
|  | 02-Mar | (11) 28.2% |
|  | 04-Jun | (4) 10.3% |
|  | >6 | (1) 2.6% |
| To what extent do you agree that you are able to manage or control symptoms of Congestive Heart Failure | Strongly agree | (6) 15.5% |
|  | Agree | (25) 64.1% |
|  | Disagree | (5) 12.8% |
|  | Strongly disagree | (3) 7.7% |
| To what extent do you agree that you have adequate or sufficient understanding of Congestive Heart Failure | Strongly agree | (10) 25.6% |
|  | Agree | (26) 66.6% |
|  | Disagree | (2) 5.1% |
|  | Strongly disagree | (1) 1% |
| Who do you believe has the majority of responsibility for managing your symptoms of Congestive Heart Failure | Cardiologist | (1) 2.6% |
|  | Jesus | (1) 2.6% |
|  | Mother | (1) 2.6% |
|  | Patient | (28) 71.8% |
|  | Shared | (6) 15.4% |
|  | Son | (1) 2.6% |
| How much knowledge do you believe your caregiver has about your diagnosis of Congestive Heart Failure | A ton | (19) 47.7% |
|  | Fair Amount | (7) 17.9% |
|  | Good Amount | (1) 2.6% |
|  | Little | (10) 25.6% |
|  | Some | (2) 5.1% |
| Who do you believe has the major responsibility for making sure your Congestive Heart Failure is controlled | Caregiver | (6) 15.4% |
|  | Primary Care Physician | (10) 25.6% |
|  | Cardiologist | (9) 23.1% |
|  | Visiting Nurse | (2) 5.1% |
|  | Self | (17) 43.6% |
|  | Other | (4) 10.3% |

**Table 1:** Patient Demographics (N = 39).

|  |  |  |
| --- | --- | --- |
| Gender | Male | (5) 23.8% |
|  | Female | (16) 76.2% |
| Race | African American | (7)33.3% |
|  | Caucasian | (12) 57.1% |
|  | Hispanic | (1) 4.8% |
|  | Other | (1) 4.8% |
| Marital Status | Single | (7) 33.3% |
|  | Married | (11) 52.3% |
|  | Divorce | (3) 14.3% |
| Number of Children | 0 | (6) 28.6% |
|  | 1 | (5) 23.8% |
|  | 2 | (3) 14.3% |
|  | 3 | (5) 23.8% |
|  | 4 | (2) 9.5% |
| Education Level | Less than high school | (0) 0% |
|  | High School or GED | (9) 42.9% |
|  | Some College or technical School | (4)19% |
|  | College Graduate of technical school graduate | (5) 23.8% |
|  | Advanced Degree | (3) 14.3% |
| Primary Care Physician | Yes | (21) 100% |
|  | No | (0) 0% |
| Smoking | Yes | (18) 85.7% |
|  | No | (3) 14.3% |
| Alcohol Use | Yes | (12) 57.1% |
|  | No | (9) 42.9% |
| Patient Smoking | Yes | (19) 90.5% |
|  | No | (2) 9.5% |
| Medical Conditions | Yes | (21) 100% |
|  | No | (0) 0% |
| Insurance | Yes | (19) 90.5% |
|  | No | (2) 9.5% |
| Forgetting Prescribed Medications | Never | (13) 61.9% |
|  | 01-Feb | (4) 19% |
|  | 03-May | (3) 14.3% |
|  | More than 6 times | (1) 4.8% |
| Heart Failure Hospitalizations | 0 | (1) 4.8% |
|  | 0-1 | (12) 57.1% |
|  | 02-Mar | (6) 28.6% |
|  | 04-Jun | (2) 9.5% |
|  | >6 | (0) 0% |
| To what extent do you agree that you are able to manage or control symptoms of Congestive Heart Failure | Strongly agree | (16) 76.2% |
|  | Agree | (3) 14.3% |
|  | Disagree | (2) 9.5% |
|  | Strongly disagree | (0) 0% |
| To what extent do you agree that you have adequate or sufficient understanding of Congestive Heart Failure | Strongly agree | (12) 57.1% |
|  | Agree | (7) 33.3% |
|  | Disagree | (2) 9.55% |
|  | Strongly disagree | (0) 0% |
| Who do you believe has the majority of responsibility for managing your symptoms of Congestive Heart Failure | Patient | (18) 85.7% |
|  | Shared (Caregiver and Patient) | (3) 14.3% |
| How much knowledge do you believe your caregiver has about your diagnosis of Congestive Heart Failure | A ton | (1) 4.8% |
|  | As much as I can | (1) 4.8% |
|  | Fair Amount | (3) 14.3% |
|  | Good Amount | (1) 4.8% |
|  | Great Knowledge | (1) 4.8% |
|  | Little | (1) 4.8% |
|  | Not Enough | (1) 4.8% |
|  | Quiet A lot | (1) 4.8% |
|  | Significant Amount | (1) 4.8% |
|  | Some | (8) 38.1% |
|  | Tons | (1) 4.8% |
|  | Yes | (1) 4.8% |
| Who do you believe has the major responsibility for making sure your Congestive Heart Failure is controlled | Caregiver | (3) 14.3% |
|  | Primary Care Physician | (1) 4.8% |
|  | Cardiologist | (2) 9.5% |
|  | Visiting Nurse | (0) 0% |
|  | Self (Patient) | (0) 0% |
|  | Other | (0) 0% |

**Table 2:** Caregiver Demographics.

**Mini Cog**

The majority of patients scored 3 or above indicating a lower likelihood of dementia (n=33; 84.6%). Scores of 0, 1, and 2 (indicating greater likelihood of dementia) were present in six patients (Table 3).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Group** |  | **N** | **Percent** | **Mean** | **Std. Deviation** |
| **Patient** |  | 39 |  | 3.59 | 1.409 |
|  | Score |  |  |  |  |
|  | 0 | 1 | 2.60% |  |  |
|  | 1 | 4 | 10.30% |  |  |
|  | 2 | 1 | 2.60% |  |  |
|  | 3 | 12 | 30.80% |  |  |
|  | 4 | 7 | 17.90% |  |  |
|  | 5 | 14 | 35.90% |  |  |
| **Caregiver** |  | 21 |  | 3.8 | 0.834 |
|  | Score |  |  |  |  |
|  | 0 | 0 | 0% |  |  |
|  | 1 | 0 | 0% |  |  |
|  | 2 | 2 | 9.50% |  |  |
|  | 3 | 4 | 19.10% |  |  |
|  | 4 | 12 | 57.10% |  |  |
|  | 5 | 3 | 14.30% |  |  |

**Table 3:** Mini Cog.

**Depression**

The majority of patients scored below 10 on the PHQ-9, indicating minimal or no depression (n=34; 87%) with a mean of 4.87. However, three patients (7%) were moderately depressed, one reported being moderately severely depressed; and one severely depressed. (Table 4).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Group** |  | **N** | **Percent** | **Mean** | **Std. Deviation** |
| Patient | Score | 39 |  | 4.87 | 4.911 |
|  | 0 | 9 | 23% |  |  |
|  | 01-Apr | 9 | 23% |  |  |
|  | 05-Sep | 16 | 41% |  |  |
|  | Oct-14 | 3 | 7% |  |  |
|  | 15-19 | 1 | 2% |  |  |
|  | 20-27 | 1 | 2% |  |  |
| Caregiver |  | 21 |  | 2.38 | 2.012 |
|  | Score |  |  |  |  |
|  | 0 | 6 | 28% |  |  |
|  | 01-Apr | 11 | 52% |  |  |
|  | 05-Sep | 4 | 19% |  |  |
|  | Oct-14 | 0 | 0% |  |  |
|  | 15-19 | 0 | 0% |  |  |
|  | 20-27 | 0 | 0% |  |  |

**Table 4:** PHQ 9.

**Caregivers**

**Demographic Tool**

The vast majority of caregivers were the female spouse, Caucasian, married, and with children. Their average age was 55 years old. They reported being a caregiver between 1 and 4 years, with a mean of 2.9 years. All caregivers identified that they had a primary care physician and insurance (90%). Caregivers reported healthy lifestyle choices. The majority, 52% also reported some college education

Caregivers reported that the majority of patients (61%) never forgot their medications and were never hospitalized for other congestive heart failure admissions (61%). Caregivers believed that the CHF patient was ultimately responsible for managing their heart failure symptoms. Moreover, caregivers reported that CHF patients were able to manage their own symptoms (76%) and had sufficient knowledge about heart failure (57%). The biggest stresses caregivers reported caring for patients with heart failure was “missing their medications or appointments” (38% of caregivers) and the patient “being moody” (28%).

**Mini Cog**

The vast majority of caregivers scored three and above indicting a lower likelihood of cognitive impairment (n=19; 90.4%)). two caregivers scored 2, indicating a greater likelihood of dementia (Table 3).

**Depression**

All of caregiver scored below 9 on the PHQ-, indicating minimal or no depression (Table 3).

**Caregiver Burden**

Caregivers burden scores ranged from 0 to 47, with a mean of 18 (SD 10.19). The majority scored in the little to no burden range (n=12; 57%). None scored in the severe caregiver burden range (Table 5-8). Caregivers reported the areas of burden were care recipient asking for more help than needed (47%), ensuring the patient took their medications/made appointments (38%); and patient moodiness 23%).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Group** |  | **N** | **Percent** | **Mean** | **Std. Deviation** |
| Caregiver |  | 21 |  | 18.333 | 10.19 |
|  | Score |  |  |  |  |
|  | 0-20 | 12 | 57% |  |  |
|  | 21-40 | 8 | 38% |  |  |
|  | 41-60 | 1 | 4% |  |  |
|  | 61-88 | 0 | 0% |  |  |

**Table 5:** Caregiver Burden Scale Frequencies.

|  |  |  |
| --- | --- | --- |
| **Score** | **Frequency** | **Percent** |
| 0 | 1 | 4.80% |
| 1 | 1 | 4.80% |
| 5 | 1 | 4.80% |
| 12 | 2 | 9.50% |
| 13 | 1 | 4.80% |
| 14 | 1 | 4.80% |
| 16 | 2 | 9.50% |
| 17 | 1 | 4.80% |
| 18 | 2 | 9.50% |
| 19 | 1 | 4.80% |
| 20 | 3 | 14.30% |
| 22 | 3 | 14.30% |
| 33 | 1 | 4.80% |
| 45 | 1 | 4.80% |

**Table 6:** Caregiver Burden Scale Scores.

|  |  |
| --- | --- |
| Question | Response |
| Years of Having Heart Failure | No Response (4) |
|  | 1 Year (10) |
|  | 2 Years (3) |
|  | 3 Years (1) |
|  | 4 Years (6) |
|  | 5 Years (4) |
|  | 6 Years (1) |
|  | Greater than 7 (10) |
| Patient Self Use of Tobacco | No (32) |
|  | Yes (7) |
| Hospital Readmissions for Heart Failure in 12 months | 0-1 Times (23) |
|  | 2 Times (11) |
|  | 3 Times (4) |
|  | 4 Times (1) |
|  | 5 Times (0) |
| Education Level | Less than High School (7) |
|  | High School or GED (16) |
|  | Some college (8) |
|  | College graduate (7) |
|  | Advanced Degree (1) |

**Table 7:** Patient Responses.

|  |  |
| --- | --- |
| Question | Response |
| Length of Time Being a caregiver | 1 Year (2) |
|  | 2 Years (5) |
|  | 3 Years (7) |
|  | 4 years (7) |
| Caregivers Response to Patient Use of Tobacco | No (1) |
|  | Yes (38) |
| Caregiver Self Use of Tobacco | No (0) |
|  | Yes (21) |
| Hospital Re Admissions for HF Reported by Caregiver | 0-1 Times (13) |
|  | 2 Times (6) |
|  | 3 Times (2) |
|  | 4 Times (0) |
| Educational Level | Less than High School (0) |
|  | High School or GED (9) |
|  | Some college (4) |
|  | College graduate (5) |
|  | Advanced Degree (3) |

**Table 8:** Caregiver Responses.

**Discussion**

The aim of this study was to identify factors associated with CHF 30-day re-admission rates through exploration of patient and caregiver demographics, cognitive status, depression and caregiver burden. Three major findings are discussed: cognitive status of patient and caregiver; depression of patient and caregiver; and the interaction between these outcome variables.

**Patients**

**Mini Cog**

Cognitive status based on the Mini Cog exam yielded several results. First, only 15.4% of patients in this study scored in the range of cognitive impairment (score of 1 or 2). This finding is in contrast to Agarwal, et al. [5] who reported that 67.7 % of patients with CHF showed cognitive impairment. There are several reasons that might explain these differences including age, length of time with heart failure, sample size and gender.

For example, the average age of patients in Agarwal’s study was 78.9 while the average age in this study was 65. Based on the literature, cognitive impairment occurs with the aging process [10]. For example, cognitive impairment declines in females after the age of 75 and after 65 for males [20]. Since the sample in the reported study was younger (65 years) and female, cognitive impairments would not necessarily have occurred.

Another difference in mini-cog scores could be the sample size. Agarwal had a sample size of 121 while the current study had 39 participants. The smaller sample size lacks diversity, limits data analysis and generalizability of the findings.

Studies have also shown that a risk factor for cognitive impairment in females is illiteracy and educational level [20] as well as subclinical depressive disorders [21]. Patients with less experience with heart failure and lower levels of education had more difficulty with self-care management [10]. The majority of patients in this study had an average educational level of high school or higher (82%) implying high literacy. Since this sample size was small and mostly educated females of a younger age (less than 65 years old) the effects of cognitive impairment could have been skewed since research shows that cognitive impairment in females is higher after the age of 75 [20].

The number of CHF patients who scored less than 10 on depression was high (n=34; 87%), indicating the majority of patients were not depressed or minimally depressed. Since depression in females has been linked to an increased risk of developing dementia [21] the fact that the study participants scored low on the PHQ-9 could have influenced the number of patients with cognitive impairment. In addition, Sohn et al. [22] reported that males have a faster verbal memory decline in the presence of normal aging, an earlier onset of cardiovascular disease and higher incident of mild cognitive impairment. A more diverse sample that included more men with a wider range of ages might have yielded results more in line with current research.

The last area that could have impacted the mini cog results was the length of time diagnosed with CHF. According to Wang, et al. [20] risk factors for cognitive impairment include cardiovascular disease (such as hypertension, diabetes, hyperlipidemia, heart failure). These risk factors increase the risk of cognitive impairment the longer the patient suffers from the disease. According to Sohn, et al. [22] as the cardio metabolic effects on the body increase, cognitive impairment increases. Since the patients in this study were on average younger and had heart failure for a mean of five years, the impact of the cardio metabolic effects on cognition may not be evident at this point in the disease process.

**Depression**

Depression has been identified as a predictor in readmission rates related to congestive heart failure [2]. The patient sample in this study had an average PHQ score of 4 indicating no depression. In this study, five patients scored above 10 (12.8%). Previous studies have reported depression rates of approximately 18 % of congestive heart failure patients [23], which is higher than found in this study. There are several possible reasons for this difference, including the screening tool, the age, length of time diagnosed with CHF, and sample size.

Jaafar, et al. [23] utilized the Hospital Anxiety and Depression Scale (HADS), which assesses both depression and anxiety for non-psychiatric patients on a four-point scale. Even though the PHQ9 and HADS are self-reported depression tools, there are differences. For example, when the HADS depression scale and the PHQ 9 are compared both show a high internal consistency (a = 0.9) [24]. The HADS scale has the advantage of evaluating both depression and anxiety but when compared to the PHQ 9, the HADS fails to identify the same cases each time [24].

The patients in the Jaafer, et al. [23] study were also slightly older with an average age of 69.2 years old. Although this age difference is not great, it might be that Jaafer, et al. [23] sample were diagnosed with CHF for a longer time and experiencing greater health issues. As heart failure symptoms progress the physical management of the disease becomes inherently more complicated. This is related to increased frailty, loss of control, and increased complexity of care [25].

Jaafer, et al. [23] had a larger sample size (N=133) compared to the 39 participants in the current study. A larger sample size is typically more representative of the population with more diversity. The small sample in this study limits the generalizability of the findings.

**Caregivers**

**Mini Cog**

The majority of caregivers (85.7%) scored above 3 on the Mini Cog, indicating minimal cognitive impairment. Research suggests that sex differences impact cognitive dysfunction. Females according to research appear to be more resistant to the impact of stress compared to their male counterpart [18]. The increased stress causes an increase in cortisol levels which ultimately leads to decreased cognitive functioning and cognitive impairment [18]. However, since there are few studies examining the impact of CHF caregiving in the literature, the results of this study will need to be examined more thoroughly when additional studies have been conducted.

**Depression**

According to Chung, et al. [2], depressive symptoms are a common source of psychological stress in caregivers with 45% of family caregivers having moderate depression when caring for end stage heart failure patients. The patients in this study on average had heart failure for five years. The average length of the caregiving role was about 2 years It would appear, based on caregiver comments, that the burden of caregiving was not great for them at this point in the caregiving experience, and thus, depression related to caregiving was not an issue.

**Caregiver Burden**

Higher levels of caregiver burden were related to worse physical function of the patient, Caregiver burden increases with higher complexity of care, advanced patient age, and poorer patient mental health [12]. As noted in this study, the majority of patients had an average age of 65, self-managed their own care 65% of the time, had minimal cognitive impairment (15%), and low depression. Agren, et al. [12] reported that initially, caregivers may feel increased self-esteem, pride and gratification when caring for their family members, but this may turn into more negative outcomes as the patient has greater physical needs, cognitive impairment and more physical symptoms. Patients in this study may be in the earlier stages of CHF with lower caregiving needs. The caregiver may be enjoying the role of caregiver where self-esteem and gratification are high and burden low.

 Being a female caregiver with depression increases the risk of caregiver burden. According to Akinci and Pinar [16], even though the majority of caregivers in their study were female their self-reported levels of depression were low. This again could be related the length of time the patient had heart failure and their overall younger age (average was 55 years old). Perhaps the patient and caregiver had not yet experienced the full impact of the problems associated with end stage heart failure such as the economic concerns, social isolation, disruption of family relationships and sense of losing control [16]. The caregivers may have noted a lower level of burden since they had only been caregivers for a limited time (mean 2.9 years) and thus, they were experiencing the positive effects of their role.

Davis, et al. [10] reported that patients with higher educational levels also have higher levels of adherence to heart failure regimens and self-care management. This is partly due to better health literacy and comprehension of instructions. In this study greater than 82% of patients reported that they had either a high school diploma or higher educational. The improved adherence to heart failure regimens would lead to better patient symptoms and outcomes thus decreasing the burden on the caregiver.

Caregivers reported an average burden score of 18 (indicating minimal burden), with 9 (42%) scoring in the mild to moderate burden range. According to the caregiver burden scale, the higher the score the greater the burden, with a max score of 88. Only one caregiver scored in the moderate to severe range When compared to other studies, those in this study reported lower scores of burdens. Chung, et al. [2] reported that caregiver burden increases the longer the caregiver is responsible for the care of the patient and is present after a year of care. The majority of caregivers (66%) in this study reported being a caregiver for greater than 3 years.

All of the caregivers reported their own health problems. Previous studies have shown that when caregivers have their own chronic illnesses the burden that they experience increases [12]. The length of time being a caregiver as well as the presence of medical concerns in the caregivers themselves would suggest that the majority of caregivers would have had a higher rate of burden. This relationship was not supported in this study. A possible explanation could be the limited number of caregivers who participated. Perhaps those who declined to participate had higher levels of caregiver burden and thus declined due to stress or other factors. Caregiver burden scales are also self-reported and can be subject to social desirability.

Caregivers reported their biggest stressors were ensuring the patient made their appointments/took their medications (38%) and patient moodiness (23%). According to research, one in every three (33%) family caregivers perceived moderate or severe difficulty managing behavioral problems that was directly related to the moodiness or irritability of the CHF patient [13]. The %age of those who reported moodiness as a stress was slightly below the research average but again this could be in part due to the limited caregiver numbers.

When caregiver burden scores were compared between caregivers more information can be derived. The caregiver who scored the highest burden score was the 66 years old daughter of a patient. She was married, had no children, earned an advanced degree and had been the caregiver for 3 years. Her caregiver burden score was 46 and her mini cog score was 5. Perhaps the caregiver felt the most burden due to the fact that she did not have children and felt more responsible with no one to share the caregiving. The next highest caregiver burden score was 34 (mini-cog score of 4) and was the 68-year-old spouse. She reported having three children, and an earned GED or high school diploma. She reported being the caregiver for three years. The lowest score caregiver burden score was 1. This was reported by the 78-year-old caregiver spouse, who stated she had 4 children. She had been a caregiver for 4 years and received a score of 2 on the mini cog.

**Serendipitous Findings**

Throughout the data collection and analyses, several serendipitous findings were noted. The first is related to self-reported smoking According to Whittaker, et al. [8], smoking impacts 38% of readmissions, and cumulative exposure associated with 1.7 to 3.4 times higher risk of mild cognitive impairment [26]. Interestingly, only 1 % of patients self-reported smoking; however, caregivers reported the CHF patient smoked 90% of the time. Moreover, patients reported that 89% of their caregivers did not smoke yet, caregivers reported smoking 85% of the time. This is an interesting area to further explore since patients may believe that admitting to smoking, either themselves or caregivers, would reflect negatively on their ability to manage their CHF [27-30].

Another discrepancy noted was the medications. Patients self-reported that they missed none of their medications yet their caregivers reported patients missed medications between 1 and 4 times (average of 1.6 times) per month. The discrepancy between patient and caregiver reports of smoking and medication administration supports the need to better understand the dynamics around these two critical aspects of CHF self-management.

 The patient’s lack of heart failure knowledge was another interesting finding. An inclusion criterion for the study was a 30-day readmission for heart failure, yet, both the patients and their caregivers reported the patient was rarely hospitalized for heart failure with several not identifying heart failure as the reason for this hospitalization. When the medical records were reviewed, a majority of patients had multiple admissions for heart failure associated complications over a course of a year. The admitting diagnosis were dyspnea, edema and chest pain which are heart failure related complications. The disconnect between understanding heart failure symptoms and hospitalization, suggests that more education about the variety and diversity of heart failure symptoms might be important for both patient and caregiver. It is also possible that patients and caregivers want to present themselves as being knowledgeable and competent in managing the symptoms at home.

The final finding of importance was the sample composition. The majority of patients who declined to participate in the study were male, stating they were “tired” or “wanted to eat.” More information on how the male CHF might have differed from the female CHF who did participate might be insightful.

**Limitations**

There are four main limitations of this study: sample size, inability to pair the patient with their direct caregiver, the tools utilized and gender of sample.

Although data recruitment lasted several months, it was difficult to recruit CHF patients and their caregivers in meaningful numbers. Caregivers either came at times the researcher was not there or the caregiver came when the patients was getting ready for discharge and their attention was on the discharge process. The small number of CHF patients and caregiver participants limits the generalizability of the findings.

The second limitation was that some caregivers who participated were not directly related to a CHF patient participant. Recruiting only caregivers directly related to the CHF patients would have provided a better insight with comparison between CHF patient responses and their caregiver on key study variables. For example, being able to compare and correlated finding on depression, cognition, and caregiver burden between caregiver and care recipient would have added to our current knowledge base.

The third limitation was the cut off score used for the PHQ-9. This study used a score of 10 or greater for depression, whereas, many studies use 5 as the cut-off for depression (indicating mild depression). Future research should use the lower score of 5 since this study may have missed those with subclinical depressive symptoms.

The final limitation was related to not analyzing the statistics separately for males and females. Statistical analyses were presented as aggregate data for the key study variables: depression, mini-cog, and caregiver burden. A more nuanced statistical analyses might have resulted in some meaningful results.

**Conclusion**

Despite the identified limitations of this study, the findings do offer insight on caregivers of those with CHF. The aim of this study was to determine if a caregiver’s cognition, depression, and caregiver burden impacted hospital re-admissions within 30 days for a CHF care recipient. The study concluded that the caregivers in this study, overall, were not depressed, were not cognitively impaired and reported low caregiver burden. However, the caregivers in this study were young, female, and had been a caregiver for about 5 years. Additional research with a broader and more diverse sample would be critical in better understanding how caregivers impact the re-admission rate for those with CHF. Unexpected findings also warrant additional research. For example, the disconnect between what CHF patients and caregivers report related to smoking, medication adherence and knowledge of CHF symptoms is unsettling and required further inquiry.

Caregivers in this study were managing. More research is needed to explore how cognitive impairment present in the caregiver not only increases the caregiver burden but also the patient’s readmission rate and subsequent mortality. If shared factors play roles it will likely be important to identify multiple interventions and personnel to coordinate and mitigate the problem. More research is needed in order to help protect not only the patient but also their most invaluable caregiver. Investigators need to find risk factors associated with not only readmission but also caregiver burden. Investigators will also need to explore ways to increase more truthful self-reporting tools that can be used for data collection.

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