2019

Evaluating the Feasibility of Outpatient IV Diuretic Therapy for Patients with Decompensated Heart Failure

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Christina A. Thompson, Student

Dr. Judi Daniels, Advisor

Evaluating the Feasibility of Outpatient IV Diuretic Therapy for Patients with decompensated Heart Failure

Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Nursing Practice at the University of Kentucky

By

Christina Thompson

Lexington, Kentucky

2019

Abstract

Heart failure is a prevalent chronic disease that contributes to many hospitalizations that may not always be necessary. Evidence supports that patients who present to the Emergency Department in fluid overload can be treated in the outpatient setting when only IV diuretic is warranted. Both decreases in costs and improved outcomes have been reported, yet there has been little movement toward providing outpatient diuresis versus hospitalization. The purpose of this DNP project was to evaluate the feasibility of an outpatient option for IV diuretic therapy for patients with acute decompensated heart failure experiencing symptoms of fluid overload. This descriptive study involved a retrospective chart review and took place at a large academic medical center. The objectives were to describe a random sample of patients that utilized an ED for IV diuretic therapy due to fluid overload from January 1, 2018 to December 31, 2018. Providers were interviewed and themes were identified to summarize their perspectives. Data analysis was performed using descriptive and correlational statistics. Significant differences were found between the LOS groups and post-ED cardiology follow-up rates ($\chi_2(1) = 4.059$, $p=0.044$), LOS groups and number of comorbidities ($t(8)=-3.628$, $p=0.000$), and number of ED visits and missed follow-up cardiology visits ($U=554.5$, $p=0.003$). Inconsistencies in documentation of instructions and medications were noted. Interview themes surrounded issues with continuity of care in this population of heart failure patients. There is a need for more synchronized transitions from the hospital to outpatient setting. Those with shorter LOS, less comorbidities, and more consistent follow-up may benefit from outpatient IV diuretic therapy. Future research should focus on best practice for more coordinated care and ways to engage patients with heart failure.

Acknowledgements

I would like to express my sincere gratitude to a number of people that have helped me complete this project and supported my efforts to obtain a DNP. I would first like to thank my clinical mentor, Peggy Hardesty, and my committee member, Martha Biddle, for their support of my project and my interest in the heart failure population. They have taught me so much about the patient population and have encouraged my efforts to improve the quality of care they receive. I would like to thank individuals at UK's Center for Clinical and Translational Science who helped me with data collection and especially to Dr. Amanda Wiggins at the College of Nursing for her help with the data analysis for this project.

There is no way to fully express my gratitude and appreciation for the help of my advisor, Dr. Judi Daniels. Dr. Daniels has been my advisor and a clinical mentor during my completion of this program. Thank you for the countless hours spent helping me complete this project. I am grateful for your guidance and encouragement to achieve every milestone I have wanted to. I appreciate your willingness to teach me and to support me to become a doctorally-prepared Nurse Practitioner.

A special thanks belongs to my amazing family and friends, who have supported my endeavors to obtain my degree without fail. To my Mom, Dad, Alec, Jackie, Ella, Maegan, and Clay, I am so grateful for the love and support that each of you have given me throughout the completion of this project and my doctoral degree. I will never be able to explain how thankful I am for your encouragement and kind words given to me many times over the last five years. I truly could not have completed this journey without you, thank you!

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Evaluating the Feasibility for Outpatient IV Diuretic Therapy for Patients with decompensated Heart Failure

Heart failure (HF) is a significant health issue affecting an estimated six million people in the United States (Jackson et al 2018). The etiology is multi-focal leading to dysfunction of the lining of the heart, the cardiac valves, or the cardiac vasculature. This chronic cardiac illness can lead to exacerbations caused by fluid overload resulting in repeated emergency department (ED) visits and hospitalizations for diuretic therapy (Collins et al, 2015; Chamberlain et al, 2017). These visits are costly and, when hospitalized, can lead to poor outcomes. Identifying patients who present in fluid overload that could be managed with outpatient diuresis has been suggested (Ota et al, 2013; Storrow et al, 2014). The purpose of this DNP project was to evaluate the feasibility of an outpatient option of intravenous (IV) diuretic therapy for patients with acute decompensated HF experiencing symptoms of fluid overload.

Background

The prevalence of HF is expected to increase 46 percent by year 2030 (AHA, 2017). This is due to a variety of factors, such as better medical advances and improved survival rates after myocardial infarction. The aging of the U.S. population, along with their medical problems, i.e. diabetes, obesity, hypertension, further contributes to the burden of HF (AHA, 2017). It is imperative to understand this disease process to improve outcomes and lessen the consequences of HF.

HF is a chronic, progressive illness that is classified by the severity of symptoms experienced by the individual and its' impact on daily life. The pathophysiology of HF centers on the inability of the heart to adequately contract to support body processes (Delgado et al, 2016). The risk for HF increases with uncontrolled hypertension, poorly managed diabetes, post-myocardial infarction, as well as any condition that impacts the structure and function of the

myocardium (Tackling & Borhade, 2019). Management of these conditions can minimize the severity of cardiac dysfunction. Treatment goals are dependent on patients' understanding of their disease process, medication compliance, and lifestyle modifications (Diaz et al, 2011; Heldenreich et al, 2013). Nonadherence to treatment leads to the symptoms well-recognized as exacerbations of HF.

The diagnosis of acute decompensated HF is based primarily on clinical signs and symptoms (Yancy et al, 2013; Collins et al, 2015; Kaur, & Clark, 2015). Symptoms of fluid overload include dyspnea, swelling, weight gain, and fatigue. The mainstay of treatment for an exacerbation is diuretic therapy. Initial management of congestion may include titration of oral diuretic medications but can often require intravenous (IV) diuretic therapy. The 2013 American College of Cardiology Foundation/American Heart Association (ACC/AHA) HF guidelines direct providers to treat patients with significant fluid overload early with IV diuretic therapy and if necessary, in the ED (Yancy et al, 2013).

The prognosis for patients with HF can be improved through medical therapy optimization and adherence to specific lifestyle modifications. These therapies include adjustment of certain medications (angiotensin converting enzyme (ACE) inhibitors, beta receptor blockers, diuretics, among others), monitoring edema, obtaining daily weights, and following salt and fluid restrictions (Unverzagt et al, 2016). The factors that can affect treatment nonadherence include demographic influences, lack of transportation or social support, financial difficulties, and misunderstanding about the disease process (Shah et al, 2015). Improved adherence to disease management guidelines have been shown to decrease likelihood of hospitalization and improve morbidity and mortality.

The economic impact of HF on the healthcare system is significant and continues to increase. It is the leading cause of hospitalizations for older adults, many of which are considered preventable (Jackson et al, 2018; Storrow et al, 2015). In the United States, HF utilizes more Medicare dollars than any other diagnosis. Currently, its estimated that HF costs are greater than $30 billion and will increase to $70 billion by the year 2030 (Dunley et al., 2010). The majority of these costs are directly associated to hospital expenses, which average more than $14,000-$30,000 per person per year (Heldenreich et al, 2013; Jackson et al, 2018; Kilgore et al, 2017). It is important to identify factors that contribute to HF exacerbations that lead to hospitalization.

Healthcare systems must explore ways to reduce the financial burden of HF. This includes finding avenues to improve patient adherence to salt and fluid restrictions, as well as medication compliance. Further, shifting treatments for HF exacerbations from the ED or inpatient setting to the outpatient setting can reduce costs and may be a viable option.

Review of Literature

In 2014 alone, HF exacerbations accounted for over one million ED visits, one million hospitalizations and over 80,000 deaths (Castello et al., 2017; Jackson et al, 2018). The majority of patients with HF that present to the ED (up to 80 percent) will be admitted to the hospital (Collins et al., 2013; Storrow et al., 2014). The reasons for this include lack of outpatient options for diuretic therapy, provider discomfort in discharging home, and lack of unclear risk stratification (Collins et al, 2013, Castello et al., 2017).

The majority of patients with HF that present to the ED simply need decongestion with IV diuretic therapy (Lazkani & Ota, 2012; Ota et al, 2013; Storrow et al, 2014, Hebert et al, 2011). Although some patients require more intensive therapies, approximately 50 percent that present to the ED do not need any interventions other than decongestion (Collins et al., 2013).

Further, hospitalizations have not correlated to overall improvement in this condition and alternatives to hospitalizations must be explored.

There have been attempts to decrease the number of patients with HF that are admitted to the hospital by creating observation units (OUs) within the ED (Collins et al., 2013). These interventions are now complicated by an increasing burden of patients and worsening overcrowding among EDs. It is important that interventions to improve the quality of life for those with HF be shifted outside of the acute care setting. When patients with HF experience acute decompensations that result in hospitalizations, their quality of life becomes poorer and their risk of mortality increases (Castello et al., 2013; Storrow et al, 2014). This illustrates the need for a different approach to the management of certain aspects of HF disease.

Hospitals are attempting to decrease HF-related admissions by focusing on interventions that can smoothly transition care from the inpatient to the outpatient setting. These interventions center on providing coordinated care, medication support and disease education to avoid preventable readmissions (AHRQ, 2015; Feltner et al, 2014). Disease-specific management programs take a variety of forms, some of which allow access to IV diuretics on an outpatient basis (Hebert et al, 2011; Pacho et al, 2017). Allowing access to this option in the outpatient setting could decrease hospital admissions and ED utilization for diuretic therapy by patients with decompensated HF.

The potential for cost savings for shifting HF-related treatments from the inpatient to outpatient setting could be over $600 million (Ota, Beutler, Gerkin, Weiss, Loli, 2013). Patients that receive IV diuretics in an ambulatory location have been shown to decrease ED utilization and hospitalizations (Lazkani & Ota, 2012; Ota et al, 2013; Storrow et al, 2014, Hebert et al, 2011). Healthcare systems must begin to place emphasis on outpatient treatment options for HF

exacerbations. There is a need to monitor the effect that an outpatient diuretic infusion clinic could have on HF related hospital admissions and ED utilization. Before this association can be further examined, it is important to identify the characteristics of the HF population that utilize the ED for treatment.

The purpose of this DNP project was to evaluate the feasibility of an outpatient option of intravenous (IV) diuretic therapy for patients with acute decompensated HF experiencing symptoms of fluid overload. The specific aims of this project were to:

(1) Identify the total number of patients who present to an urban, tertiary ED between January 1, 2018 and December 31, 2018 requiring IV diuretics,

(2) Identify the demographics of a randomly selected sample of these patients,

(3) Examine the comorbidities and severity of HF within the sample,

(4) Identify the number of patients of the sample that are admitted to an inpatient unit from the ED for IV diuresis,

(5) Explore the relationship between length of stay (LOS) and comorbidities and adherence to Cardiology appointments of those that were admitted from the sample for IV diuretics,

(6) Examine the sample's clinic utilization and recorded adherence to treatment plan prior and after the ED visit within the project period,

(7) Identify the number of patients within the sample who were readmitted within 30 days of discharge,

(8) Identify ED and cardiology providers' perceptions regarding the scope of the problem and its potential causes of the problem.

Theoretical Framework

Theoretical Frameworks are used in healthcare to solve problems using a systematic approach (Peterson et al., 2019). The Social Ecological Model (SEM) is a framework that can help communities understand the impact that certain factors have on a process of concern. This model was developed to help define the dynamic relationship between individuals and their environment (Sallis, Owen, & Fisher, 2008; CDC, 2013). Because health is influenced by community and individual factors, this approach can help identify interventions that address all determinants of health.

The SEM is a framework that examines determinants of health and interventions at the individual and population levels, with the goal of creating an environment conducive to change (CDC, 2013). The SEM of health promotion defines the different levels of influence: individual, interpersonal, organizational, community and policy (Sallis, Owen, & Fisher, 2008; CDC, 2013). Interventions are more likely to be effective when they address all of these determinants.

The different levels of the SEM were considered while examining the factors that may have contributed to fluid overload symptoms resulting in ED utilization for the project population. Individual factors that were assessed included race, gender, age, dietary and medication compliance, and outpatient care utilization. Interpersonal factors that were analyzed included marital status or the availability of a support system for their disease burden. Disposition of care after the initial ED encounter, length of stay, and discharge care instructions were organizational factors that were examined. Location of the patient's primary address was gathered to assess for a relationship between the project population and their community.

Current policies within the organization were assessed for ambulatory management of acute decompensations of HF. There was no existing policy in place to guide the management of

IV diuretic therapy in the outpatient setting. Interest was expressed by cardiology and ED providers to further explore the opportunity of establishing an outpatient IV diuresis program.

Methods

Design

This project was a descriptive study designed to explore the characteristics of patients with HF who present to the ED for management of symptoms of decompensated HF. A retrospective chart review of 100 randomly selected patients who presented to the ED with symptoms of HF was conducted to determine their demographics, co-morbidities, disposition, and outpatient clinic utilization. Providers from the ED and cardiology services were asked to participate in a structured interview to identify their perceptions about the scope and potential causes of the problem. In addition, they were asked their opinion on the feasibility of an outpatient option for IV diuretic therapy. This chart data was inclusive of patients seen in the ED between January 1, 2018 to December 31, 2018. Provider interviews were conducted after completion of data collection.

Setting

This project took place at a large urban academic medical center in central Kentucky. The affiliated hospital is a 945 bed acute care facility with access to a number of specialties, including cardiology. The ED is a level one trauma center with a 104 beds with a sister hospital that has 180 beds and 20 bed ED. For the provider interviews, all were conducted in the providers' private office or in secluded area of ED.

Sample

Following IRB approval from the University of Kentucky, the Center for Clinical and Translational Science generated a list of all patients who presented to the ED with a diagnosis of

HF that received IV diuretics in the project period (January 1, 2018 – December 31, 2018). The following ICD-10 codes were used for identifying patients with heart failure: I50.1: Left ventricular failure, unspecified, I50.2: Systolic (congestive) heart failure, I50.3: Diastolic (congestive) heart failure, I50.4: Combined systolic (congestive) and diastolic (congestive) heart failure, I50.8: Other heart failure, and I50.9: Heart failure, unspecified. Patients who had Left Ventricular Assist Devices, were on chronic milrinone infusions, received dialysis or were under the age of 18 were excluded. Patients were also excluded if they died during hospitalization or were discharged to hospice.

Providers included for the interviews consisted of those who work in the ED and cardiology services. An email was sent to providers explaining the purposes of the interview and amount of time necessary for completion. Consent was obtained and participation was voluntary. A total of 5 providers consented for the interview. No student providers were included. Only attending physicians, nurse practitioners, and physician assistants were eligible to complete interviews.

Congruence of Project to Organization's Mission

This project supported the hospital's mission to provide the most advanced patient care for the region. Intrinsic within that mission is the goal of offering services that are cost-effective and lead to the best patient outcomes. This project helped to identify where resources could be shifted form an inpatient to an outpatient environment. Further, the mission centers on encouraging the development novel services that can be disseminated to the medical community to improve care.

Facilitators and Barriers to Implementation

The stakeholders for this project included those providers who care for patients with HF. Their input was critical in understanding the concerns and liability they may find with treating HF in an outpatient setting. Many may find it easier to admit a patient, rather than risk the potential complications associated with outpatient diuresis. Concerns about the logistics of developing an outpatient option for diuretic therapy include space and personnel. It is essential to avoid getting focusing on those details without first understanding the extent of the issue.

Hospital administrators also have a vested interest in this issue. The desire to reduce unnecessary hospitalization, avoid readmissions within 30 days, and facilitate the patient experience falls under their prevue. Presenting an un-biased view of the problem is essential, as well as presenting data to support another approach to treating HF. The financial benefits of outpatient IV diuresis must be emphasized. Insurance companies, along with hospital billing, would likely support this shift of care. Including these parties in the discussion is critical and would help influence hospital administration to further support this transition.

Patients may be both supporters and barriers to the implementation of outpatient IV diuretic therapy. This approach may be different to what they have experienced in the past. HF exacerbations are stressful situations and patients and/or their families may not be receptive to a new treatment approach. One aspect that may help in overcoming their fears will be to ensure that adequate outpatient follow-up. This circles back to the need for providers' support. If the provider is not supportive, the patients and hospital administration will less likely be agreeable.

Data Collection

For the sample of patients, data was obtained through the hospital's electronic medical record. All patients included in the sample were given a unique study number for de-

identification purposes. A crosswalk table that linked the study number to their MRN was created and kept separately from the study data on an encrypted, password-protect desktop computer located in the office of Emergency Management at UK. See Appendix A for Data Collection tool. All collected data was organized on an electronic spread sheet, secured using RedCap.

All eligible providers were sent an email (See Appendix B) to participate in the interview. See Appendix C that was used to obtain consent from providers. A structured interview lasting 10-15 minutes was conducted at a time and place of the providers' choice. See Appendix D for the Interview guide. All providers were de-identified, except for their practice area. Data was presented in aggregate form based on their area of service.

Data Analysis

Descriptive statistics were used to describe the demographics of the population, including frequency distributions, standard deviations, and means. Correlational statistics were used to explore relationships between most recent clinic utilization and presentation to ED. Level of significance was set at p 'less than or equal to' 0.05. For the interviews, common themes were identified with comparisons between the services. The average length of stay in hospital days will be calculated. Analysis was conducted in SPSS version 22.

Results

A total of 448 patients met the inclusion criteria within the project period. From this population, 100 patients were randomly selected for project purposes. The following statistical analysis center on these 100 patients.

Sample Characteristics

Sample characteristics including age, gender, race, marital status, and home location were collected and reported in Appendix E. The mean age of sample was 66 years, with a range of 25-90 years. The sample was equally distributed between male and female genders (n=49, n=51, respectively). The majority of the sample was Caucasian (74%), with Black the other prominent ethnicity (22%). More than half of the sample lived within the same county as the hospital (63%). Slightly less than fifty percent reported being married (47%) with the remaining patients reported as being single (13%), divorced (13%), or widowed/separated (27%).

Heart Failure Characteristics

For the sample population, Ejection Fraction (EF), comorbidities, and lab values on initial encounter to the ED were collected. EF was defined as preserved (55% or greater) and reduced (less than 55%). The majority (74 %) had reduced EF of less than 55 percent.

A list of the comorbidities for the sample group is found is Appendix F. The mean number of comorbidities was six, with a range of three to 13. The following comorbidities were analyzed for the sample group but were not specifically reported because they were cited in less than 10 percent of the sample: Cancer, Cirrhosis, Congenital Heart Defects, Dementia, Hepatitis C, Intravenous Drug Abuse, Organ Transplant, Peripheral Vascular Disease, and Coronary Artery Bypass Graft (CABG). The notable lab markers obtained from the initial ED encounter were the NT-proBNP, Glomerular Filtration Rate (GFR), and Hemoglobin A1C. The mean of the NT-pro BNP was 8088 with the range from 164 to 52391 pg/mL. The mean GFR was 46 mL/min with a range from 6-60mL/min. The average Hemoglobin A1C was 6.56 percent with a range of 5 to 13 percent. All collected lab markers were included in Appendix G.

Disposition, Length of Stay, and Readmissions

The disposition of the patients was reported as discharged from ED, admitted to hospital, or admitted for observation. The majority of the sample were admitted to the hospital (87%), with 13 percent either discharged from the ED or admitted for 24-48 hour observation. The average LOS was 4.5 days, but there were outliers that drove the mean higher. Almost 20 percent of the sample population had a previous ED encounter and HF admission within 30 days of the initial encounter date.

Two groups were formed based on LOS: patients with LOS two days or less (45%) and patients with length of stay three days or greater (55%). No differences were found between LOS groups and age, pre-ED appointment rates for cardiology providers. There was a significant difference found between the LOS groups and post-ED cardiology follow-up rates ($\chi_2(1) = 4.059$, $p=0.044$). Those patients with LOS two days or less were more likely to keep their follow-up appointments, unlike those with LOS greater than three days.

The number of comorbidities also differed between the two LOS groups. Those with LOS three days or greater had significantly more comorbidities ($t(8)=-3.628$, $p=0.000$). The comorbidities that were significantly more present in the three days or greater LOS group were chronic pain ($p=0.048$), mood disorder ($p=0.017$), pulmonary hypertension ($p=0.023$), renal disease ($p=0.044$), and thyroid disease ($p=0.049$). There were significant differences in systolic blood pressures and LOS groups ($t(98)=2.24$, $p=0.027$).There were no other significant associations found between the collected lab values and LOS groups.

For the group that had a previous 30-day HF readmission, there was no association between a 30-day readmission and the total number of comorbidities ($t(98)=0.486$, $p=0.628$). Specific comorbidities were examined to see if there were any associations with 30-day HF

readmissions, but no significant associations were found in this sample. There was no significant association found between 30-day HF readmissions and either LOS group ($\chi_2(1) = 1.576$, p=0.209).

Follow-up

Follow-up appointment attendance with a cardiology provider was collected before and after their ED encounter. For the pre-ED Cardiology appointments, 58 percent had been seen six months prior to their ED visit, with half of those seen within a month before their ED visit. A third of the sample either cancelled or no-showed to their appointment prior to their ED visit. For the post-ED Cardiology visits, 31percent were seen within less than a month, 13 percent of the sample were seen between two to four months, while 33 percent cancelled or no showed to their follow-up appointment. Data on primary care provider (PCP) appointment attendance could not be gathered for most of the sample as they had a provider outside of the health system in which this project took place. There was no association found between those patients that missed their pre-ED cardiology provider appointments and those that missed their post-ED cardiology provider appointments.

Though the visit reasons could not be collected for all encounters, 95 percent of the patients went to the ED between three to six times in 2018. There was no significant difference found between the total number of ED visits in 2018 for patients that missed their pre-ED cardiology appointments compared to those that kept appointments (U=1004.5, p=0.690). There was a significant difference found between the number of ED visits for those that missed their post-ED cardiology visits (U=554.5, p=0.003). Patients that did not attend follow-up appointments had a greater number of ED visits per year. Those who did not attend appointments

had a median of 4 total ED visits compared to those that did attend, who had a median of two total ED visits.

There was no association between pre-ED cardiology appointment attendance and 30 day HF readmissions (χ_2 (1)=0.063, p=0.802 & χ_2 (1)=0.027, p=0.868, respectively), nor was there a significant difference between 30 day HF readmissions post-ED cardiology appointment attendance (χ_2 (1)=0.651, p=0.420 & χ_2 (1)=0.397, p=0.529, respectively). No significant difference was found between 30 day HF readmissions and LOS days (U=720.5, p=.665).

Discharge Instructions

Discharge information from hospital or ED discharge was collected and categorized only for those that had an attended follow-up appointment. For these patients, the majority saw their cardiology provider (61%) after their ED/hospital encounter, 16 percent saw their PCP, and 23 percent saw both their cardiology provider and their PCP. The remaining 40 percent either did not keep their follow-up appointment or requested an outside provider. For the patients that did attend a post-ED/hospital visit with their cardiology provider, the ED/hospital visit was addressed in 80 percent of those visits.

The documentation of ED discharge instructions was examined for this group and topics were formed. The most common recommendations at ED or hospital discharge were provider medication compliance (93%) and follow-up (89%). Other recommendations included a heart healthy diet (39%), sodium restriction (31%), monitoring weight (24%), and fluid restriction (20%).

Information about the medications for the sample population were collected at the time of their ED/hospital discharge and at the time of their first follow-up appointment. Appendix H is a summary of the most common medication classes patients were prescribed. No patients were

noted to be prescribed a Non-steroidal Anti-Inflammatory Drug (NSAID) or home oxygen. When comparing prescribed medications at time of discharge and then at their follow-up appointment, the two lists often did not match. It was not clear whether changes were made.

Provider Interviews

A total of five providers were interviewed to assess perceptions regarding the scope of and causes of HF exacerbations. Three ED physicians and two cardiology providers participated in the interviews. Similarities and differences in the providers' opinions were noted regarding the characteristics that may lead to exacerbations in this population and potential for improvements in care.

Providers saw a variable number of patients with HF that were in need of IV diuretic therapy per week, with the ED providers noting more incidences. Providers identified a number of factors that contributed to exacerbations that require IV diuretics. They reported: noncompliance with medication or dietary treatment plan, number of comorbid conditions (hypertension, myocardial infraction, valvular disease), inability to get in touch with their HF provider, or the "cyclical nature of the disease."

Use of the ED for exacerbations was also explored. From the perspective of cardiology providers, patients were referred to the ED for IV diuretic therapy if they were hemodynamically unstable (extreme blood pressures, low oxygen saturation), had poor renal function, were experiencing extreme shortness of breath, or were unable to perform activities of daily living. They reported "exhausting efforts to keep patients out of the ED by titrating oral mediation [regimens]" as tolerated. One cardiology provider felt that the nature of the disease often necessitates ED utilization or hospital admission.

The decision to admit patients from the ED to the hospital was difficult for Cardiology and ED providers. Most noted that the decision to keep patients in the hospital was based on the underlying etiology of the exacerbation; i.e. was the cause from medication noncompliance or due to hypertensive crisis or myocardial infarction. Clinical symptoms that necessitated hospital admission included hypoxia, labored breathing, significant edema, worsening renal function, significant lab marker elevations or electrolyte abnormalities, and questionable social support. Exacerbations with mild symptoms caused by dietary or medication noncompliance could be discharged home from the ED.

The use of the ED for the evaluation and treatment of HF exacerbations does impact the flow within the ED. ED providers and Cardiology providers acknowledged the impact on patient flow within the ED. One ED provider had previous experience at a similar hospital setting that did have an outpatient infusion center for IV diuretic therapy for HF patients. In that setting, "it [significantly] helped decrease unnecessary visits" to the ED and inpatient setting. There was an expressed interest with exploring this service within the institution's providers.

Inadequate communication between Cardiology and the ED was identified as an issue within the current system. When a patient presents to the ED with a HF exacerbation, the ED "reinvent[s] the wheel every time they refer to cardiology" to discuss the care of a HF patient. The inpatient providers often aren't familiar with the patient, their history, previous lab values, or treatment plan.

Opinions on the potential for a population of HF patients to be seen in an outpatient IV diuretic clinic were gathered. These opinions varied, but three of the five providers believed most patients sent to the ED could be seen in an outpatient setting for IV diuresis. Concerns among all providers regarding an outpatient option for IV diuretic therapy were logistical issues.

Establishment of clear guidelines would be needed to be able to identify reasons for exacerbations, how and who could make referrals to the service, who would be ultimately assume liability for complications, and the availability of resources to support both providers and patients.

One cardiology provider stated that there is a specific interest in "those [patients] that were [admitted to hospital] for less than a 48 hour period." There is a strong indication that these patients "could be managed as an outpatient." The providers offered criteria that could be used for an outpatient treatment for IV diuresis. They cited the need for hemodynamic stability, ability to ambulate safety, established cardiology provider in the same system, viable transportation, stability of certain lab values (that they do not define), and adequate patient health literacy. This was interpreted as patients that could weigh themselves, verbalize knowledge of their medications, and understanding of disease process.

Improving the continuity of care by maintaining strong follow-up with a primary HF provider among this patient population was a common theme. among all providers. It was difficult for ED providers to consider discharging a patient due to uncertainty of outpatient follow-up plan. There was significant concern over liability. Both provider disciplines believe there are gaps in providing continuity of care. Providers noted issues in the current system to include a lack of standardized communication between Cardiology and the ED.

Discussion

The overall goal of this project was to examine if there was a population of HF patients that could have their exacerbations managed with IV diuretic therapy in an outpatient setting. The results illustrated some known and new information about this population. There is the

potential for a group of patients in this sample to be managed in an outpatient setting based on LOS, comorbidities, and clinical factors.

Similar to what has been reported in the literature, these results show that patients with HF utilize the ED frequently, have variable outpatient follow-up, and have an increased risk of 30 day readmissions (Hasegawa, Tsugawa, Camargo, & Brown, 2014). The majority of the patients in this project went to the ED between three to six times in one year. Although it was difficult to establish an exact visit reason for ED presentation for the sample, all were treated as though they were having an exacerbation. This warrants concern as Duero Posada et al. (2018) report that multiple ED visits within a six to twelve month period increase the risk for poor outcomes and mortality.

Frequency of ED visits for HF have been related to inadequate outpatient care management (Hasegawa, Tsugawa, Camargo, & Brown, 2014). In this project, the number of missed appointments was associated with the number of ED visits. These results highlight the problem with follow-up from the ED to the outpatient setting. Even in those that attended a follow-up appointment, approximately 20 percent did not have their recent ED/hospital visit discussed. This is consistent within the literature where there is a need for better systems to facilitate transitions of care knowing that acute exacerbations of HF are considered preventable through appropriate disease management (Blecker, Ladapo, Doran, Goldfeld, & Katz, 2014; Duero Posada et al, 2018). One clear example of this were the differences noted between the inpatient and outpatient medication reconciliation records. This has a broad range of consequences for providers and patients, as it may ultimately contribute to acute exacerbations rather than preventing them.

As almost 90 percent of the sample was hospitalized, it was important to look at length of stay to help determine appropriateness for potential outpatient IV diuretic therapy. Almost half of the patients in the sample had a LOS of two or less days. Patients with a LOS of two or less days had fewer comorbidities and attended their follow-up appointments. Prompt follow-up after ED visit has been shown to decrease readmissions and disease morbidity (Duero Posada et al, 2018). This group may potentially be amenable for outpatient IV diuretic therapy. In contrast, those with a LOS of three or more days had significantly more comorbidities and as reported by Duero Posada et al. (2018), adds to the complexity of disease management. The significant comorbidities common among this group were chronic pain, mood disorder, pulmonary hypertension, renal disease, and thyroid disease. Patients with HF and these comorbidities may not be appropriate for outpatient treatment of fluid overload with IV therapy.

Those with fewer comorbidities may be amenable to outpatient IV diuretic therapy as their HF is less likely complicated by other illnesses. Patients typically not considered appropriate for outpatient IV diuresis include those with a concern for acute cardiac event or advanced renal failure. Typically, patients with decompensated HF (reduced or preserved EF) can be seen in the outpatient setting if they are hemodynamically stable, resistant to oral medications, report symptoms of overload, and have evidence of hypervolemia on exam (Lazkani & Ota, 2012).

The literature is inconsistent with a conclusion as to whether certain lab markers are important when considering which patients may be eligible for outpatient IV diuretic therapy (Ullo, M., & Sugalski, G., 2019). There were no other significant associations found between any collected lab values compared to LOS groups in the project sample. These results may support that certain lab markers may not be necessary to obtain prior to considering a patient

appropriate for outpatient treatment. Although the majority of the sample had a reduced EF, many outpatient models of IV diuretic therapy show no difference in outcomes between the two groups (Buckley et al., 2016). Individuals with preserved or reduced EF may be eligible to be treated as outpatients for fluid overload symptoms.

The patient-related factors that can help reduce heart-failure related ED visits are medication therapy and lifestyle modifications (Ullo & Sugalski, 2019). These were assessed through discharge instructions at time of ED discharge and follow-up. The most common recommendations at ED or hospital discharge were provider medication compliance (93%) and follow-up (89%). There were varying inconsistencies among documentation of treatment recommendations and medications, making it difficult to assess if these were adequately addressed in the sample population. Most patients in the sample saw their cardiology provider for follow-up, though PCPs were also listed for follow-up. Having multiple providers often leads to mismanagement of disease processes (Rich, Lipson, Libersky, & Parchman, 2012). It is critical that one provider be identified as primarily managing the condition.

Medicare continues to reduce reimbursement for readmissions for certain conditions, with 83 percent receiving a penalty in the most recent reports. These cuts could cost hospitals an estimated $563 million (Rau, 2019). Almost 20 percent of the sample population had a previous HF admission within 30 days of the initial encounter date. There were no associations found between 30-day HF readmissions and pre-ED or post- ED appointment attendance with a PCP or cardiology provider or with LOS days. Attention needs to be paid to the prevention of readmissions in those with HF.

In examining patient characteristics that would be appropriate for outpatient IV diuresis, it is also important to have support from both ED and Cardiology providers. There were several

general themes identified from the interviews. ED providers were not comfortable with the long-term management of HF and have difficulty with deciding dispositions, leading to more hospital admissions. In this project, exacerbations were noted to be due to a variety of factors. These factors were most often medication or dietary noncompliance, social factors, and the cyclical nature of the disease was found.

Providers agree that outpatient management needs improvement and that there is a potential patient population that could have their exacerbations treated in the outpatient setting. Ziaeian and Fonarow (2016) emphasized the importance of consistent follow-up with a HF provider. They report this significantly decreases the number HF exacerbations seen in the ED. The most important step to preventing mild to moderate HF exacerbations is to identify those that have manageable problems with outpatient treatment compliance. The barriers noted for establishing an outpatient model of IV diuretic therapy were consistent with the literature and included lack of space, staff, support from administration and patient interest (Buckley et al., 2016). Overall, improving the continuity of care among this HF population is important to reduce ED utilization and hospital admissions.

Implications for Practice, Education, and Future Research

Medicare has challenged hospital systems to focus on ways to reduce readmissions. Concerns have been raised by hospital administrators about the difficulty to create programs that actually produce better outcomes. Reducing unnecessary hospital admissions for HF will not be effective if the responsibility is placed solely on the inpatient setting. It is essential that ambulatory care clinics and hospitals work together to ensure their patients are receiving necessary care.

In the setting for which this project took place, there is not currently a way for patients to receive IV diuretic therapy on an outpatient basis. There are differences in the literature regarding the most reasonable strategy for ambulatory diuretic administration to prevent ED utilization (Buckley et al., 2016). Future research would include the assessment of current outpatient IV diuretic clinic models and their efficacy.

It is necessary to examine the patient's experience of their disease. Outpatient options for IV diuretic therapy have been shown to be well-utilized by HF patients for overload symptoms. The results of this project show the potential for a group of patients that would be eligible. It would be helpful to assess the patients' perspective on utilization of an outpatient clinic. The hallmark of HF is symptom classification, which are described by the patient.

The literature suggests that markers commonly assessed in the ED that are associated with morbidity in HF are renal dysfunction, hypotension, hyponatremia, elevated BNP, and elevated troponin. These may need to be reviewed in combination with clinical presentation to make a decision on whether a patient is appropriate for outpatient treatment of volume overload (Ullo, M., & Sugalski, G., 2019). Focusing on those with fewer comorbidities would be the starting point in identifying those that could receive outpatient IV diuresis.

It would be important to evaluate PCP opinion as many of these providers do primarily manage HF for some of their patients. Their threshold for considering a patient appropriate for outpatient IV diuretic therapy may be lower than other providers due to their lack of experience with the condition. The lack of consistent medication reconciliation adds to the complexity of treatment management. This encompasses 50 percent of the recommended treatment regimen and emphasizes the need for follow-up post-ED or hospital discharge, where the discharge

instructions are specifically addressed. This may be accomplished by having a focused provider along with a transitions of care team for this population.

Limitations

There were a few limitations to this project. While completing the chart review for the sample, it was difficult to establish the specific symptoms that initiated the patient going to the ED. This would have been helpful in further identifying those that may be eligible for outpatient IV diuresis. For example, one presenting with chest pain would need to be evaluated differently than one with increased swelling. Information on appointment history and follow-up education was unable to be obtained on patients that had an out-of-network PCP or cardiology provider because of the limited access to one EHR system. This would have provided a complete picture of the sample.

Although marital status was investigated, the results did not support an understanding of the sample's social support system. Social support can help individuals with HF have better disease management. The specific lab markers that were reviewed for the sample were chosen in an attempt to form a more complete clinical picture. The lab markers were only obtained at one time point during the project period, which may have limited the ability to analyze their specific impact on the disease management of the sample population.

Although the primary residential location of each subject in the sample was obtained, it would have been helpful to further examine the characteristics of each area. The distance of the patient to a hospital and availability of local services would have been informative when considering why the sample utilized certain resources. The burden of HF disease within this sample population was not exclusively studied. Examining disease burden would have helped

quantify the morbidity of HF and led to more informative conclusions about the impact that outpatient IV diuretic therapy could have.

Although the sample population was assessed for the presence of a general mood disorder, depression was not explicitly examined. Depression is relatively common among patients with HF and contributes to disease burden and poor outcomes (Mbakwem, Aina, & Amadi, 2016). Assessing for the prevalence of depression specifically would have contributed to the overall picture of this sample and may have revealed the need for more attention to its impact on the HF population.

It would have been helpful to identify the symptom classifications of HF (I-IV) for each patient within the sample population. It was difficult to assess for classifications because of a lack of consistent documentation in the EHR. Treatments for HF are typically targeted based on these classes. For example, aggressive prevention of worsening heart function is typically the focus in Class I or II , where palliative care or more conservative approaches might be utilized for patients with Class III or IV HF.

Conclusion

The results of this project revealed the potential for a group of patients with HF to be treated for fluid overload symptoms with IV diuretic therapy in the outpatient settings, specifically those with a LOS of two days or less. The patients in this sample were found to have inconsistences in follow-up appointment attendance, discharge and disease management instructions, and medication records. These issues result in disease mismanagement and could specifically contribute to HF exacerbations and contribute for readmissions and worsening disease morbidity. Interviews from ED and cardiology providers reiterated these results and stressed the need for more synchronized transitions from the hospital to outpatient setting. Future

research should focus on efforts to prevent hospitalizations and to provide more coordinated care for patients with HF.

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Appendices

Appendix A:

Data Collection Tool

Measures	Description	Level of Measurement	Data Source
Demographics			
Gender	Male v. Female	Nominal	Medical Record
Ethnicity	White, Black, Hispanic, Indian, Native American, Middle Eastern, Asian, Other	Nominal	Medical Record
Age	Age in years	Interval/Ratio	Medical Record
Insurance	Passport, Private, Medicaid, Medicare, Other, Self-Pay	Ordinal	Medical Record
Outcome Measures			
ED visits	Number of patients with HF seen in ED	Quantitative	Medical Record
Length of Hospital Stay	Length of stay in days, based on admission and discharge days	Quantitative	Medical Record
Number of patients that received IV Diuretics	Number of patients with ADHF that are given IV diuretics	Quantitative	Medical Record
# of 30 day HF readmissions	Number of patients with ADHF that have at least 2 hospital admissions within a 30-day time period	Quantitative	Medical Record
Selected Project ICD 10/CPT codes			
I50.23	Acute on chronic systolic (congestive) heart failure		
I50.33	Acute on chronic diastolic (congestive) heart failure		
I50.43	Acute on chronic combined systolic (congestive) and diastolic (congestive) heart failure		
I50.813	Acute on chronic right heart failure		
E87.70	Hypervolemia/fluid overload		
J1940	Furosemide injection		
Z95.811	CPT/ICD codes for LVAD present is		

Appendix B:

Email to Providers

IRB Approval
7/31/2019
IRB # 51505
ID # 173886

Dear Provider,

My name is Christina Thompson, BSN-RN, and I am a member of the UK College of Nursing DNP Class of 2019. I am completing a project on evaluating the need for an outpatient option for Intravenous (IV) diuretic therapy for patients at the University of Kentucky. I would greatly appreciate your perspective about your professional experience with this proposed problem and patient population. The goal of this research is to identify if there is a need for this kind of therapy for patients with heart failure at the University of Kentucky.

Your participation is voluntary. It requires the completion of a short in-person interview will be set up at a time and place of your choice. The interview will not last longer than 30 minutes, with an estimated time of completion to be 15 minutes. The questions that will be asked are provided in this email and do not involve the specific disclosure of any identifiable patient information or situation. Your responses will be written on paper by me, the P.I., and will not be recorded in any other way. The written responses will be destroyed in confidential bins after transferring the responses to a document that will be stored on a secure, password protected desktop within UK Healthcare. Your name will not be disclosed with your responses in the study results. You may choose to skip any question from the interview you do not wish to answer.

If you have questions about the study, please feel free to ask; my contact information is given below. If you have any complaints, suggestions, or questions about your rights as a research volunteer, contact the staff at the University of Kentucky Office of Research Integrity at 859-257-9428 or toll-free at 1-866-400-9428.

Thank you in advance for your assistance with this important project.

Please contact me with nay questions,
Christina Thompson, BSN, RN
Principal Investigator
270-317-1282
Christina.thompson@uky.edu

Appendix C:

Provider Consent Form

IRB Approval
7/31/2019
IRB # 51505
ID # 161078

Consent and Authorization to Participate in a Research Study

KEY INFORMATION FOR A RESEARCH STUDY OF EVALUATING THE NEED FOR OUTPATIENT IV DIURETIC THERAPY FOR PATIENTS WITH DECOMPENSATED HEART FAILURE

I am inviting you to complete an interview for a research study about the need for an outpatient option for IV diuretic therapy for patients with decompensated heart failure. We are asking you because you are a provider that may care for individuals in this patient population. This page is to give you key information to help you decide whether to participate. you have questions later, the contact information for the research investigator in charge of the study is below.

WHAT IS THE STUDY ABOUT AND HOW LONG WILL IT LAST?

By doing this study, I hope to learn if outpatient IV diuretic therapy is an option for those patients who present with decompensated heart failure in the Emergency Room. The goal would be to prevent a hospital admission for diuretic therapy. This study involves the retrospective data collection of heart failure patients in 2018. Your participation in this research will include a brief interview regarding your clinical opinion of this topic and completion of 5-7 questions. The interview will last anywhere from 15 minutes to no more than 30 minutes. It will be conducted by the P.I. at a time and place that is chosen by you.

WHAT ARE KEY REASONS YOU MIGHT CHOOSE TO VOLUNTEER FOR THIS STUDY?

Your participation in this study may not directly benefit you. However, your participation will help the PI to understand the providers' opinions on this topic and has the potential to improve the care and quality of life of individuals with heart failure at UK.

WHAT ARE KEY REASONS YOU MIGHT CHOOSE NOT TO VOLUNTEER FOR THIS STUDY?

There are no perceived risks of volunteering for participation to complete this interview. You have the right not to volunteer to complete the interview at any time.

DO YOU HAVE TO TAKE PART IN THE STUDY?

If you decide to take part in the study, it should be because you really want to volunteer. You will not lose any services, benefits or rights you would normally have if you choose not to volunteer. You may choose to skip questions you do not wish to answer.

WHAT IF YOU HAVE QUESTIONS, SUGGESTIONS OR CONCERNS?

The person in charge of the study is Christina Thompson RN, Principal Investigator (PI) of the University of Kentucky, College of Nursing. If you have questions, suggestions, or concerns regarding this study or you want to withdraw from the study his/her contact information is: christina.thompson@uky.edu or 270-317-1282.

If you have any questions, suggestions or concerns about your rights as a volunteer in this research, contact staff in the University of Kentucky (UK) Office of Research Integrity (ORI) between the business hours of 8am and 5pm EST, Monday-Friday at 859-257-9428 or toll free at 1-866-400-9428.

INFORMED CONSENT SIGNATURES

Signature of provider subject,	**Date**
Printed name of research subject	
Signature of Principal Investigator or Sub/Co-Investigator	

Appendix D:

Provider Interview Guide

Provider questions for Interview: Attending Physicians or Nurse Practitioners:

- Can you estimate how many patients you see in a day/week in heart failure that require IV diuretic therapy?
- What do you think are the reasons on why patients present in fluid overload?
- For outpatient providers: What criteria would make you send a patient to the Emergency Department to receive IV diuretic therapy (Clinical presentation; Labs; etc.)?
- For outpatient providers: If a patient presents with symptoms of fluid overload, what interventions would you try first before administering IV diuretic therapy?
- In the current system, how do you think patient care and patient flow is impacted within the ED when these patients present?
- What are your admission criteria for patients that need IV diuretic therapy? Which patients have to be admitted and which could go home (Clinical presentation, labs, etc.)?
- What percentage of patients that you admit for IV diuretic therapy could be seen in an outpatient setting?
- What might the criteria for outpatient Iv diuretic therapy include?
- What do you think the barriers are to develop an outpatient option for IV diuretic administration?

Appendix E:

Table of Sample Demographics

Table of Demographics for Sample Population.	
Demographics	**Mean (SD) or n (%)**
Age	66
Gender	
Male	49 (49%)
Female	51 (51%)
Race	
Caucasian	74 (74%)
Black	22 (22%)
Hispanic	
Location	
Local (Fayette County)	63 (63%)
Non-local (Outside of Fayette County)	47 (47%)
Marital Status	
Single	13 (13%)
Married	47 (47%)
Divorced	13 (13%)
Widowed/Separated	27 (27%)

Appendix F:

Table of Selected Comorbidities

Table of Selected Comorbidities for Sample Population	
Comorbidities	**Percentage of Sample**
Arrythmia	58%
Hyperlipidemia	61%
Congestive Heart Failure (CHF) Unspecified CHF Systolic CHF Diastolic CHF	100% 24 % 51% 25%
Chronic Pain	15%
COPD	32%
Diabetes (all types)	53%
Hypertension	87%
AICD/ Pacemaker	22%
Myocardial Infarction	20%
Mood Disorder	30%
Obstructive Sleep Apnea	20%
Thyroid Disease	20%
Valve Replacement	14%

Appendix G:

Initial Lab Markers for ED Encounter for Sample

Table of Descriptive Statistics for Initial ED Labs for Sample.					
	N	Minimum	Maximum	Mean	Std. Deviation
Last BP diastolic	99	38	116	78.26	16.452
BP systolic	99	87	178	132.31	21.239
Potassium	99	2.6	6.0	4.204	.6608
CR	99	.59	7.09	1.4344	.86762
A1C	87	4.5	12.9	6.560	1.6298
NT-pro BNP	99	164	52391	8149.34	10379.472
GFR	91	6	60	46.01	13.250

Appendix H:

Summary of Common Medications for the Sample (percent of sample prescribed medication)

	Discharge Medications	Outpatient Medications
Thiazide Diuretics	5%	18%
Loop Diuretic	44%	68%
Potassium Sparing Diuretic	11%	20%
Beta Blocker	50%	66%
ACE/ARB	24%	56%
Calcium Channel Blocker	5%	26%
Hydralazine	7%	9%
Statin Medication	34%	13%
Mood Adjustment Drug	4%	7%