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Over six million Americans live with heart failure (HF) each day (Matsukawa, et al., 2021). Ensuring high quality access to care for these individuals is imperative. This access can be particularly challenging for those living in rural America. There are multiple barriers to accessing care in rural communities (Agency for Healthcare Research & Quality, 2018). Reducing barriers to this access has the potential to reduce re-admission rates and overall morbidity and mortality related to living with HF. The purpose of this Doctor of Nursing Practice (DNP) Scholarly Project was to conduct a post-discharge medication reconciliation using telehealth technology within 48 hours of discharge from the hospital for patients with a discharge diagnosis of HF. The project aims included the following: 1) Utilize telemedicine in a rural health clinic to conduct medication reconciliation with HF patients within 48 hours of discharge; 2) Contact HF patients and reinforce the need for post-discharge follow-up; 3) Determine if there is any impact on reducing heart failure readmission rates through these interventions; and 4) Determine if telemedicine has a role in reducing barriers and improving outcomes.

Background and Significance

HF readmission rates have not changed significantly over the past decade, with approximately 6.1 million individuals impacted (Matsukawa, et al., 2021). However, as there are projected to be 61 million baby boomers by 2030, the HF rate is projected to increase to approximately 8.5 million people (Urbich, M., et al., 2020). Mean HF specific hospitalizations costs is $14,323, while the mean cost for a 30-day readmission for HF is an additional $6,283 (Urbich, M., et al., 2020).

It is important to note that of this growing number of patients living with heart failure, and the associated costs, it is estimated that 30-40% of these patients will have an in-patient admission due to their HF (Urbich, M., et al., 2020). This burden impacts those living in the lowest income quartiles most significantly. According to the Healthcare Cost and Utilization Project (H-CUP), for patients in the top income quartile (Q1), HF ranked as the number three principal diagnosis with a rate stay of 234.8 per 100,000 stays. Comparing this to the fourth quartile (Q4, lowest), HF was the number two principal diagnosis with a rate of 455.8 per 100,000 stays (Agency for Healthcare Research & Quality, 2021), demonstrating a disparity in outcomes based on income.

This disparity is further magnified by regional location. In the southern United States, HF ranks at the top of the list in terms of cost and is the most preventable adult inpatient diagnosis (Agency for Healthcare Research & Quality, 2018). The southern region also had the highest inpatient stay rate for chronic conditions with 1,168.5 hospitalizations per 100,000 population. Compared to their urban counterparts, rural areas had the highest rate for preventable chronic conditions at 1,107 hospitalizations per 100,000 population (Agency for Healthcare Research & Quality, 2018).

While HF is a complex diagnosis, communication at discharge is a key factor in preventing HF readmission rates and medication errors. It is estimated that the home medication list upon discharge contains eight to 13 errors and omissions and that 67% of home medication lists contain errors as well (Ziaeian, B., 2012). One study estimated 16% of 30-day readmissions were due to medication errors with 40% of those readmissions being preventable (Makary, M. A., & Daniel, M., 2016). Patients often wait until the follow-up appointment to address any

medication concerns such as cost or medication intolerance, rather than seeking out clarification on their own sooner, creating a potential gap in care.

Review of the Literature

To further explore this issue, EBSCOhost, Cumulative Index Nursing Allied Health Literature (CINAHL), and Medline were utilized. The search was limited to publications after 2012 and keywords included: telemedicine, rural health, primary care, nurse practitioner, Doctor of Nursing Practice, medication reconciliation, heart failure, and readmission rate. Articles were chosen based on relevance, methods, sample size, scholarly works, journal articles, and full text in English language. Articles were excluded if they were letters to the editor, opinion pieces, non-scholarly works, articles older than ten years, or were focused on: Neurology, Pediatrics, Psychiatry, Pain Management or Addiction Management. Three themes emerged from the literature as it relates to reducing readmission rates for HF patients in rural areas: 1) barriers to healthcare access in rural areas; 2) current discharge practices for HF patients; and 3) telehealth utilization. Each area will be discussed in relation to reducing readmission rates for patients living with heart failure in rural settings.

Barriers to Healthcare Access in Rural Areas

There are a significant number of healthcare providers in rural areas who are nearing retirement as part of the baby boom era. Rural communities losing providers due to retirement struggle to recruit and retain new providers to care for patients due to economic factors (Leider, J.P., et al., 2020; Petersen, et al., 2015). In addition, fewer medical school graduates are applying for Internal Medicine, General Practice, and Pediatrics residencies to subsequently return to rural communities to fill the vacancies of those individuals retiring. The American Association of Medical Colleges predict that they would have to increase the number of Family Practice / Internal Medicine slots by 21%, year-over-year, to meet the demand of primary care needs across the United States (Petersen, et al., 2015).

In addition to fewer providers to provide care to heart failure patients in rural communities, people living in rural areas of the United States have multiple physical and societal barriers to healthcare (Jensen, L., et al., 2020). Barriers may be related to time constraints secondary to work obligations, limited means of transportation, or limited funds for travel to the nearest healthcare facility (Leider, J.P., et al., 2020). Travel time to access healthcare for many rural areas can take anywhere from 30 minutes to a full day's drive. Travel also requires dependable transportation, along with the financial resources and ability to take off work for appointments. These barriers coupled with an older population or those living without the financial means to travel, makes getting to and receiving adequate healthcare a challenge (Jensen, L., et al., 2020).

Current Discharge Practices for HF Patients

Medication reconciliation is customarily performed by nursing. The reconciliation process occurs at each transition point in patient care, including transfers between units, transfers to another facility, or discharge to home. At the time of discharge, nurses review discharge medication orders with the ordering provider and they provide discharge teaching (Center for Medicare & Medicaid Services, 2020). In addition, pharmacists ensure an accurate medication list is in place upon discharge and they provide any additional medication teaching needed for the patients as well (Center for Medicare & Medicaid Services, 2020; Stewart, A. L., & Lynch, K. J. 2014).

Another process in place in the in-patient setting to support patients upon discharge, includes a management process where providers are reimbursed for contacting patients on a routine basis to review medication lists and identify any problems patients have experienced since discharge (Center for Medicare & Medicaid Services, 2020). Patients often receive a printed discharge packet which includes a discharge medication list, as well as any changes to this list such as new medications, discontinued medications, and follow up instructions. Frequently patients receive printed material with details in lay terms related to their medicines. The day of discharge is a busy and stressful time for patients and

families. Teaching patients and families regarding any changes during this stressful time is difficult (Matsukawa, et al., 2021).

Many times, patients are at home before they realize they have questions related to their medications. Patients may or may not elect to contact the prescribing provider or their primary care provider for clarification but may instead wait until their follow-up to address these questions. This time lapse can contribute to medication errors, omissions, side effects and delays in treatment. One such example is a patient's inability to pay for a medication or the need for prior authorization to be completed for the patient to be able to receive the medication (Matsukawa, et al., 2021).

Telehealth Utilization

To address the barriers to healthcare and challenges in current discharge practices, Telehealth has shown to be a viable tool for patients, providers, and nurses to communicate after discharge. This technology allows for real-time assessment and intervention of the patient's needs without the additional burden of travel to and from offices for follow-up appointments (Kane-Gill, S.L., 2021). HF patients can be monitored frequently and safely in their own surroundings, allowing a more detailed view of their social setting which nurses and physicians would not otherwise see by only seeing patients in the office (Matsukawa, et al., 2021).

Current literature supports the need for further research of telehealth as a tool to reduce HF readmission rates through regular follow-up, timely medication review, and access to healthcare (Kane-Gill, S.L., 2021). Access to care is important for all patients and especially HF patients who also have multiple comorbidities which further complicates their care. For HF patients living in a rural environment, access to specialty care is particularly important and telehealth is a means for them to access the care they need (Leider, J.P., et al., 2020.

Telehealth is a viable option to affect HF disease burden. With the ever-expanding technological capabilities of cellphones, computers, and EHRs, patients can be cared for by multiple specialists without

leaving their home (Kane-Gill, S.L., 2021). Patients can have more timely diagnosis and treatments initiated, decreasing the number of emergency room visits or admissions/re-admissions (Kane-Gill, S.L., 2021, Matsukawa, et al., 2021). These interventions ultimately decrease the financial burden to the patient, as well as the health systems, while providing a necessary service to the rural population who is disproportionately affected by a lack of access to a full spectrum of healthcare services (Urbich, M., et al., 2020).

The current HF readmission rate is approximately 26% (Benjamin, E., et al. 2019). This rate is constant despite current practices, and while the rate may be constant, the numbers are growing (Virani, S.S., 2020). Current strategies do not significantly decrease short-term mortality or relative risk reduction (Yun, J.E., et al., 2018). New strategies that have a greater impact on long-term (greater than 12 month) mortality are needed (Yun, J.E., et al., 2018). The literature supports further research in the use of telehealth as a tool to reduce HF readmissions (Kane-Gill, S.L., 2021). Providers can be reimbursed for their services when they utilize telehealth as a means to expand access to care for their patients (Center for Medicare & Medicaid Services, 2020), and patients in rural areas are able to receive services they may not otherwise be able to access without telehealth (Jensen, L., et al., 2020, Leider, J.P., et al., 2020, Petersen, et al, 2015). Increased use of telehealth services could reduce HF admissions as well as the financial burden and health disparity in rural areas, where there are some of the highest numbers of comorbidities and readmission rates in the United States (Agency for Healthcare Research & Quality, 2021, Urbich, M., et al., 2020).

Methods and Procedures

The Iowa model is a framework used to help identify possible clinical issues and evaluate them to create and implement evidence-based solutions into clinical practice. This model was used to identify opportunities during the discharge and follow up process of reviewing discharge

medication list with heart failure patients (Iowa Model Collaborative, 2017). IRB approval was obtained prior to data collection.

Participants

Participants of this DNP Scholarly Project were from a convenience sample of patients admitted and then discharged with a diagnosis of heart failure, International Classification of Diseases (ICD)-10 Code I50, at one 337 bed hospital in rural southeastern United States. Inclusion criteria were those patients either admitted or discharged with a diagnosis of heart failure being 18 years old and older between the dates of October 1, 2021, to December 31, 2021, by two internal medicine physicians as their attending physicians. e

Setting

The setting for this study was a 337-bed hospital where heart failure patients were admitted. This facility was a referral center for a 15-county service area; four of the counties in the service area do not have a hospital located within their county. The clinic where the researcher completed the follow up intervention was a rural health clinic in south central Kentucky. This was the primary care home for patients discharged from this hospital. In addition, there was a virtual environment in which the medication reconciliation took place. This involved the researcher, who is a primary care provider, communicating with discharged patients via telehealth.

Intervention

The first step of this intervention was to capture hospital discharges of patients with a diagnosis of heart failure (ICD code I50) who were discharged to home. This process took place during the researcher's daily review of patient admissions and discharges at the hospital. The

researcher had access to Meditech, the electronic medical record (EMR) shared by the clinic and hospital to provide care for all current patients. The EMR was password protected and housed in a secure, password protected computer. The standard discharge process for HF patients included arranging a two-week follow up appointment with their primary care provider. Follow-up appointments were scheduled by the discharging nurse when the discharge took place during clinic hours. However, if the discharge took place after clinic hours or on weekends, the patient was provided instructions in their discharge materials to call and make an appointment the next business day. For this study, all discharged patients with HF were contacted by the researcher within 48 hours of discharge.

Logging and tracking of patients who were discharged with HF took place with the use of an Excel spreadsheet housed on the researcher's clinic work computer. Patient data was coded and de-identified in the data-analysis phase. Participants were contacted by either traditional telephone, or a combination video-voice call using programs such as FaceTime or Google Duo when access to these programs and adequate internet access was available to patients enrolled in the program. Each telehealth encounter consisted of the researcher completing the medication reconciliation with the patient and identifying any errors and taking corrective action if needed.

Evaluation plan

Indicators and Data Collection

Demographic data on all participants was collected for descriptive statistics in this study. This included the patient's age, gender, race, and medical diagnoses upon discharge from the hospital. Additional data related to hospitalization and discharge included the following: 1) date of hospital admission; 2) date of discharge; 3) whether the two-week follow-up appointment was

scheduled on discharge or if the patient was instructed to call to make the appointment on their own; 4) confirmation that a follow up appointment was made; 5) date follow up call took place; 6) number of medication errors or omissions discovered during medication reconciliation; 7) interventions required based on the medication reconciliation; 8) change in medication adherence; 9) whether the follow-up appointment was kept; and 10) whether readmission to the hospital occurred within a 30-day period. The primary indicator used for measurement was the heart failure readmission data. Data from the study participants was compared to benchmark data from Fiscal Year 2019 through Fiscal Year 2020 at equal data points.

Data Analysis

Data analysis was completed using SPSS Version 27. Demographics of the intervention group (n=35) and the control group (n=8), which included the sample of patients from one year prior during the same time period were identified (Table 1). The intervention group was older (67.6 years (SD 9.143), had a higher percentage of female participants (29%), and while they were primarily Caucasian (83%), the sample also included African American participants (17%) when compared to the control group, which was 100% Caucasian. The LOS for the intervention group was also shorter at 4.75 days (SD= 2.964) when compared to the control group which was 7.37 days (SD=6.288).

Table 1. Descriptive Statistics of Two Groups

	Participants	Mean Age	Gender	Ethnicity	LOS
Intervention Group	N=35	67.63 years SD 9.143	M=25 (71%) F=10 (29%)	Caucasian (83%) African American (17%) Hispanic (0%) Other (0%)	4.75 days (SD= 2.964)

Comparison Group	N=8	60.88 years, SD=13.260	M= 7 (87%) F= 1 (13%)	Caucasian (100%) African American (0%) Hispanic (0%) Other (0%)	7.37 days (SD=6.288)

The mean LOS for all participants is 6.95 days. All patients had a discharge diagnosis of HF. Of note, the sample LOS in the intervention group for men was 8.4 days and for women, it was 4.8 days. Another noted difference was by ethnicity. Caucasian patients in the intervention group had a LOS of 7.83 days (N=29), while African Americans had a LOS of 5.17 days (N=6).

To determine if there were any statistical differences between groups for age and length of stay, the Levene's test was run. There was no significant difference (t=3.894, p=1.729) between the control group (mean =60.88 years) and the intervention group (mean =67.63 years) for age. There was also no significant difference (t=1.581, p=1.142) between the control group (7.37 days) and the intervention group (4.75 days) for LOS.

When looking at outcomes for the study participants, 33 had their two-week follow-up appointment scheduled upon discharge and one was discharged after hours and was therefore instructed to make a follow-up appointment on the next business day. Twenty-eight patients received attempted contact within 48 hours of discharge for a telehealth visit. The seven remaining participants were unable to be contacted due to death (n=2) or discharge to a nursing home (n=5). Fourteen participants had a completed telehealth visit within the 48-hour timeframe. For all participants in the study, 60% kept their two-week follow-up appointment regardless of the telehealth intervention. This number was higher at 69.3% for participants who received the telehealth visit within 48-hours of discharge and lower at 42.9% for participants where were not able to be contacted within that 48-hour time period.

Regarding the medication reconciliation process, no medication errors or omissions were discovered. In addition to reviewing for mediation errors, the researcher also inquired about medication adherence. While there were no errors discovered on the discharge orders, 65% of the participants had a change in medication adherence, meaning they were not taking one or more medications as prescribed. On average, patients had 16 medications on their medication list on discharge. Examples of change in medication adherence included not taking medications due to side effects. No interventions were required outside of patient teaching and encouraging the patients to keep scheduled follow up appointments.

The primary measure of this study was readmission to the hospital within 30 days of discharge. As a whole, this group was compared to the sample population from the same time period one year prior. As noted previously, the groups were not statistically different by age or LOS. There also was not a statistical difference between 30-day readmissions for the control group (25%) and the study group (25%) (p=1.00). When looking at the study participants, 15 (42.9%) were readmitted within 30 days due to HF. For the group that was contacted within 48 hours versus the group whom the researcher was not able to contact within 48 hours, there was not a statistical difference in readmission. However, patients who kept their two-week post-hospital follow-up in the office were less likely to be readmitted within 30-day (p=<.001) (Table 2).

Table 2
Post telehealth and two-week office follow-up readmission rate

	N	Pearson Chi-Square	df	Asymptomatic Significance (2-sided)

48-hour telehealth & 30-day readmission	24	1.600	1	.206
2-week office follow-up appointment & 30-day readmission	24	13.594	1	<.001

Discussion

The purpose of this study was to conduct a post-discharge medication reconciliation using telehealth technology within 48 hours of discharge from the hospital for patients with a discharge diagnosis of HF at one rural health clinic and hospital setting. The goal was to utilize telehealth as a resource to reduce barriers to care and improve outcomes, specifically the reduction of hospital readmissions. Conducting a telehealth visit with HF patients within 48-hours of discharge did not reduce the rate of readmission within 30-days of discharge (H_o). However, patients were less likely to be readmitted due to heart failure if they keep their two-week post-discharge office visit. This was encouraging to see that keeping the two-week follow up visit makes a difference. The literature supports follow up care within seven to 14 days of discharge and is a quality indicator for patients discharged from the hospital with heart failure (Dev, et.al, 2021)

Limitations of this study included a single hospital site with convenience sampling along with challenges in contacting participants withing the 48-hour timeframe. The primary barrier to making contact within 48 hours included poor response to phone calls. This may have been due to unfamiliarity with the caller ID number, lack of time, or lack of interest in follow-up care. More studies need to be conducted with additional settings and methods to secure telehealth follow up care should continue to be explored.

From a practice perspective, providers in the primary care setting must continue to identify barriers to care as well as interventions to overcome those barriers when patients are discharged from the hospital with HF. Even though telehealth did not decrease readmission rates, patients anecdotally seemed to be satisfied with the process. Future studies could explore patient satisfaction or confidence in their provider when a 48-hour follow-up telehealth visit is completed. Further research could also be done to explore patient perception of barriers and how to address them. There is a role for using telehealth in the future as a way to monitor HF patients, provide early intervention, and ensure access to care.

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