IMPACT OF A PHARMACIST-LED INTERVENTION PROGRAM ON THE READMISSION RATES OF ELDERLY HEART FAILURE PATIENTS

Pui Shan Chu, PharmD candidate Class of 2017[1]; Pamela M. Moye, PharmD, BCPS, AAHIVP[1,2]
Mercer University College of Pharmacy, Atlanta, GA 30341[1]
Atlanta Medical Center[2]

Abstract

Purpose: Heart failure accounts for over 6.5 million hospital days and an estimated $37.2 billion is spent on heart failure management annually in the United States.[1,2] Since the establishment of Hospital Readmission Reduction Program by Affordable Care Act, hospitals have been trying to reduce the hospital readmission rate of all the patients. The purpose of this study is to determine whether pharmacist intervention would reduce the readmission rate of elderly patients aged 60 years and over.

Methods: A pilot study compared to historical control group conducted at a teaching hospital. Retrospective chart review was conducted for heart failure elderly patients admitted to the hospital from March 1st, 2013 to June 30th, 2014. Heart Failure elderly patients admitted from July 1st, 2014 to October 31st, 2015 received the pharmacist intervention during their hospital stay including post discharge follow up. The primary outcome was the readmission of the patients within 30-day post discharge.

Results: The primary outcome occurred in 12 of 97 patients in the intervention group (12.4%) and 20 of 80 patients in the control group (25.0%). Of the heart failure patients included in the study (N=177), there was statistically significant reduction in the patients in the intervention group compared to the control group.

Conclusion: Pharmacist intervention significantly reduced the primary outcome of readmission to the hospital within 30-day post discharge among the elderly population. Future studies can focus on readmission rate of patients with other disease states.

1. Introduction

Heart Failure (HF) is a major disease state that is known to have high morbidity, mortality and cost. There are about 5.8 million Americans diagnosed as having HF and over 650,000 patients are diagnosed with HF each year.[1] In the United States (U.S.), there are more than 1 million hospitalizations for HF annually.[2] It accounts for over 6.5 million hospital days and estimated $37.2 billion spent on HF annually in the U.S.[2]

According to American Heart Association, HF is one of the most common hospitalized reasons for the people age 65 and older.[1] HF is particularly prevalent among the elderly group.[3] From the National Heart, Lung, and Blood Institute-sponsored Framingham Heart Study (FHS), incidence of HF approaches 10 cases per 1000 population after the age of 65.[4] Thus, aging of the population is widely recognized as the contributing factors of increasing incidence of HF. [2]

2. Background and significance

The National Quality Forum has utilized hospital risk-standardized readmission rates (RSRRs) as the performance measures for the hospitals.[5] The Centers for Medicare and Medicaid Services also report the data publicly.[5] Approximately 20% of the Medicare beneficiaries are readmitted within 30 days of discharge, costing over $15 billion per year.[5] Patients with HF are one of the highest disease groups accounting for a significant proportion of the 30-day all-cause readmissions among Medicare.[5,6]

A considerable amount of unplanned readmissions is due to medication-related issues, including inappropriate medication management, drug related problems and failure to adhere to the medication regimen.[7,8] Other contributing factors are failure to adhere to fluid and dietary restrictions and failure to seek early treatment for escalating symptoms.[7,8] Doctors and nurses lead most existing interventions attempting to reduce readmissions of HF patients. However, since medication-related problems contribute largely to the readmission rate, the inclusion of pharmacists in the multidisciplinary team

could potentially resolve this problem and improve patient outcomes. Studies have shown that pharmacists can contribute to improve medication adherence, reductions in readmissions, mortality and length of hospital stay.[7,8,9]

There are studies conducted on pharmacist interventions to reduce readmission rates. However, they have some limitations restricting the validity of the study outcomes and their applicability on the clinical setting. Stewart *et al* have shown that a pharmacist intervention would reduce the readmission rate.[10] Nonetheless, the study period tended to be long (up to 12 months), even though short-term data (30 days) would be of greater value for hospital due to the Medicare reimbursement policies.[8] Also, the severity of the patients in the trials was not reported in the study of Szkiladz *et al.*[9] Different levels of severity of HF patients may have different outcomes.[8] For instance, less severe patients may lead to a lower readmission rate. It is an important factor to consider due to the potential bias for the study outcome. In Bouvy *et al* study, patients in the control group received the "usual treatment" but the detailed description of their treatment was unavailable.[7] This information is important to allow for better explanation regarding the differences in outcomes between treatment and control groups.[7]

This study was designed to overcome the limitations of the existing studies stated above. Furthermore, most studies targeted on broad age group which included patients aged ≥18.[9] The main focus of this study was the elderly population, defined as aged ≥60.[11,12] In this project, together with the standard care interventions (i.e. a case manager, a physician and a nurse), the pharmacist played an important role in patient care. If the study is able to prove that pharmacist-led intervention can reduce the readmission rate of the elderly HF patients within 30-day post discharge, it would improve the utilization of healthcare resources, expand pharmacist's role, provide the ground for hospital-wide education program and intensify post discharge follow-up of HF patients by pharmacists.

3. Specific aim

The objective of this study was to assess if the impact of the pharmacist-led intervention program will reduce the readmission rate of the elderly patients with HF.

Atlanta Medical Center (AMC) has a hospital goal of ≥ 95% compliance with all core outcome measures; this study hypothesized that a pharmacy intervention program will reduce the rate of 30-day hospital readmissions for HF patients 60 years of age or older to ≤ 5%.

4. Approach/Methodology*:*

Sample: The study was a retrospective study conducted at AMC. Elderly patients admitted to AMC for HF was analyzed for this study over a period of 12 months. Patients were categorized into two groups: an intervention group and a historical control group. The follow-up time period was one year.

a. **The historical control group**: consisted of patients ≥ 60 years of age admitted to AMC between March 1 2013 to June 30 2014 with ICD-9 diagnose code 428 and/or ICD 10 diagnosis code I50 for HF. This group of patients who received standard care from a case manager, a physician and a nurse only. Physicians used evidence-based medicine to manage patients and case management set post-discharge appointment within 7 days of discharge. Nurses ensured patients had access to scale at home and contacted each patient 72 hours after discharge. They did not receive the medication reconciliation, tailored inpatient counseling and/or individualized telephone follow-up after discharge by a pharmacist. The control group patients were retrospectively screened for moderate to high risk for readmission as described for the intervention group.

b. **The intervention group**: consisted of patients ≥ 60 years of age who received additional care managed by the pharmacists at AMC during July 1 2014 to October 31 2015. They had to have been diagnosed with ICD-9 diagnosis code 428 and/or ICD 10 diagnosis code I50 for HF. Case manager conducted a risk assessment on every patient using Allscripts® to determine if the patients were at moderate to high risk for hospital readmission. In addition to the management provided by physicians and nurses as described in the historical control group, the patients in intervention group received pharmacists' management as well. The services include conducting consult for patients, providing medication reconciliation and discharge counseling. The pharmacists provided a binder for each individual patient to take home as part of their discharge education. It included an individualized medication record, fluid sodium intake log and weight/symptom log. On day 14 and

30 after discharge, the pharmacists followed up with the patients to assess adherence to scheduled appointments, medication regimens, diet restrictions and hospital readmissions via a phone call. In order to resolve any clinically related or unintended medication discrepancies, the communication record between pharmacists, the corresponding physicians and nurses was documented. All the interventions and outcomes was recorded in standardized collection form. The data collected was then verified by at least two pharmacists.

Population: The inclusion and exclusion criteria for the patient population are described as follows:

a. **Inclusion Criteria:** The study focused on the elderly population with ≥ 60 years of age.[10,11] Patients admitted to AMC from July 1 2013 to June 30 2015 with a primary or secondary admission diagnosis of HF who were at moderate or high risk for readmission. This included patients with ICD-9 diagnosis code 428 and/or ICD 10 diagnosis code I50 for HF. The case manager identified and conducted a risk assessment on each patient using a software program called Allscripts®.

b. **Exclusion Criteria:** Patients aged < 60 years of age, regularly living out of the metro area of the hospital, regularly living in a nursing home, discharged to a social-health center or to other centers for acute patients or have any type of dementia or disabling psychiatric disease.

Description of the Intervention:

a. **Medication Reconciliation**: The pharmacist compiled a list of patient's current medications, which accurately depicted the name, dosage, frequency and route. The pharmacists compared the current list in use, and assessed for any discrepancies, changes, and hence identify a complete list of medication.
b. **Information on Drug therapy**: The pharmacist provided thorough medication information, both verbal and written, to the patients during patient counseling. The pharmacist assessed the patients' understanding on the medication instructions, identify and resolve any concerns with potential incompliance. The importance of adhering to the medication was also reinforced.
c. **Personalized binder/notebook**: Each patient received a personalized binder/notebook comprised of the following components. Patients were instructed to bring it to all future doctors' appointments.
    i. **Personal Medication Record**: Each patient received a personalized medication record that included the list of medications prescribed. It contained all the medication information, including the indication, dose, frequency and major side effects (Appendix A).
    ii. **Weight and Symptom Log**: Each patient received a weight log and was instructed to record their daily body weight and the symptoms experienced (Appendix B).
    iii. **Fluid and Salt Intake log**: Each patient received a fluid and salt intake log and was instructed to record their daily fluid and salt intake (Appendix C and D).
d. **Telephone Follow-up**: The pharmacist conducted follow-up phone calls to patients on day 14 and 30 to reinforce the intervention and address any possible concerns and problems (Appendix E).

Data Collection/Study Variables: The dependent variables were the number of days elapsed after discharge to the first readmission for HF or another cause. The independent variable was the allocated group – the intervention or the historical control group. The participants' demographic information was collected to allow comparison between groups. The demographic variables included: age, sex, New York Heart Association (NYHA) functional class, ejection fraction, past medical/surgical history, drug therapy on hospital discharge, social history, type of insurance and presence of a caregiver.

Statistical Analysis: The baseline demographic information of the patients was analyzed descriptively using two-tailed t-test with 95% confidence level. If there were any between-group differences in demographics, they were controlled for in later statistical analysis. The primary outcome of the control and the intervention group was compared with relevant demographics variables using analysis of variance (ANOVA). Results were considered significant with $p<.05$. All analysis was performed using SPSS 21.0 software.

5. Results

Study Patients and Follow-up: From March 1st 2013 to October 31st 2015, a total of 177 patients were admitted at Atlanta Medical Center and met the inclusion criteria for the study. The control group has 80 patients, and the intervention group has 97 patients.

Subgroup Analysis: There was a statistically significant between-group difference in arrhythmia (Table 1). Aside from that, the baseline characteristics of both groups were not significantly difference from each other (Table 1).

Table 1. Selected Baseline Characteristics of the Study Patients

	Control n=80	Intervention n=97	P-value
Age (years)	71.5 ± 8.9	70.3 ± 7.4	0.33
Male sex no., (%)	29, (36.3)	33, (34.0)	0.76
Weight (kg)	88.2 ± 25.4	92.8 ± 34.0	0.33
Height (in)	67.1 ± 4.8	66.3 ± 4.7	0.25
BMI (kg/m^2)	30.4 ± 8.2	32.6 ± 12.4	0.16
Hospital Stay (days)	5.1 ± 3.3	5.9 ± 4.5	0.18
Ejection Fraction <40% no., (%)	38, (47.5)	40, (41.2)	0.70
Co-morbidities no., (%)			
Anemia	18, (22.5)	13, (13.4)	0.11
Arrhythmia	19, (23.8)	38, (39.2)	0.03
COPD/Asthma	28, (35.0)	35, (36.1)	0.88
Depression	5, (6.2)	11, (11.3)	0.24
Diabetes	35, (43.8)	47, (48.5)	0.53
Coronary Artery Disease	37, (46.3)	46, (47.4)	0.88
Hypertension	66, (82.5)	84, (86.6)	0.45
Myocardial Infarction	10, (12.5)	16,(16.5)	0.45
Obesity	14, (17.5)	15, (15.5)	0.72
Renal Disease	28, (35.0)	39, (40.2)	0.48
Thyroid	8, (10.0)	14, (14.4)	0.37
Pacemaker/ICD	15, (18.8)	17, (17.5)	0.83
Social History			
Smoker no., (%) †	28, (35.0)	47, (48.5)	0.07
Alcohol Use no., (%)‡	13 (16.3)	14, (14.4)	0.74
Illicit Drug Use no., (%)	2 (2.5)	1, (1.0)	0.87
Follow up with cardiologist no., (%)	32, (45.1)	24, (40.7)	0.6739
Follow up with primary care physician no., (%)	59, (83.1)	50, (84.7)	0.6275
Home Health no., (%)	32, (45.1)	40, (67.8)	0.0095
Discharge medication			
Beta Blocker no., (%)	73, (91.3)	85, (87.6)	0.44
ACEIs/ARBs no., (%)	50, (62.5)	48, (49.5)	0.08

Diuretics no., (%)	54, (67.5)	73, (75.3)	0.25
Digoxin no., (%)	10, (12.5)	12, (12.4)	0.98
Aldosterone Antagonist no., (%)	17, (21.3)	21, (21.6)	0.95
Nitrates no., (%)	19, (23.4)	29, (29.9)	0.36
Warfarin no., (%)	18, (22.5)	17, (17.5)	0.41
Calcium Channel Blocker no., (%)	14, (17.5)	28, (28.9)	0.08
Other Cardiovascular Medication no., (%)	31, (38.75)	41, (42.3)	0.64

† Include current and past smokers who have quitted smoking no longer than ten years
‡ Include only current use of alcohol

Primary Outcome: A total of 32 patients was readmitted to the hospital within the 30-day period after discharged: 12 patients (12.4%) in the intervention and 20 patients (25.0%) in the control group (Table 2). Within the readmitted group, 18 patients were readmitted due to heart failure: 7 patients (58.3%) in the intervention and 11 patients (55.0%) in the control group.

Table 2. Incidence Rates of the Primary Outcomes

	Control n=80	**Intervention n=97**	**P-value**
Primary Endpoint			
30 Day Readmit no., (%)	20, (25.0)	12, (12.4)	0.03
Readmission related to HF no., (%)	11, (55.0)	7 (58.3)	0.85

6. Discussion

The study showed that the pharmacist intervention significantly reduced the incidence rate of the primary outcome. 25.0% of the patients in the control group had been readmitted within the 30 days of discharged. On the other hand, the readmission rate in patients in the intervention group was 12.4%. The number needed to treat was 7.9. Considering that the care received was comparable in all the patients, the reduction in the number of readmissions could be attributed to pharmacist intervention. This study suggested that incorporating pharmacist intervention to standard of care might decrease 30 day readmissions in patients with heart failure. Although readmission was not reduced to $\leq 5\%$ in the elderly population group, it was reduced by more than 50%. There was a significantly larger number of patients with arrhythmia in the intervention group ($p<0.05$), it attributes to a higher than expected rate in the intervention group.

There were several limitations of the study. First, the study covered a small sample size, which translated into small samples of readmitted patients. This limitation may be eliminated by extending the length of the study. Second, although we only included patients living in the metro area of Atlanta, patients might have been admitted to other hospitals within 30-days of discharge from AMC. Hence, the actual readmission rate might be higher than the observed one. Third, majority of the patients included in our study were African Americans. Hence, the study would only be applicable to similar demographics characteristics.

In conclusion, we compared the readmission rate within 30-day post discharge between the intervention group and the control group. The pharmacy-led intervention significantly reduce the readmission rate of the elderly patients with heart failure. Future studies can focus on readmission rate of patients with other disease states.

7. Conclusions

The impact of the pharmacist-led intervention program had a statistically significant reduction in the readmission rate of the elderly patients with HF.

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Appendix A: Personal Medication Record

HEART FAILURE PATIENT DISCHARGE MEDICATION LIST

PATIENT NAME_____ **DISCHARGE DATE**_____

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Medication, Dose, and Frequency	Type of Medication	What this Medication Does	Side Effects	Comments
	ACE INHIBITOR	·! Lowers Blood Pressure ·! Help your heart work more efficiently. ·! May help you live longer.	·! You may feel dizzy or lightheaded, especially when you stand up. To reduce this, sit up for a few seconds before standing. Stand up slowly to give your body a chance to adjust. ·! Occasionally, may cause a dry cough that doesn't go away.	·! Patients who take ACE inhibitors often live longer and their hearts work better. ·! Don't stop taking the medicine without first talking to your doctor. ·! Work with your doctor to get the right amount of ACE inhibitor and take it as directed.
	BETA-BLOCKER	·! These medications act by slowing the heart rate and reducing the workload of the heart. ·! Lowers Blood Pressure ·! May help you live longer.	·! May make you feel slightly worse for the first few weeks after you start taking it. These side effects usually go away. They include: ·! Shortness of breath ·! Tiredness ·! Weight gain ·! Slow pulse ·! Lower blood pressure ·! Dizziness ·! Worsened asthma	·! Patients who take Beta-blockers often live longer and their hearts work better. ·! Helpful if your blood pumps normally, but you have heart failure caused by a heart that is stiff and thick.
	DIURETIC (WATER PILL)	·! Help your body get rid of excess water and salt.	·! Sometimes, they make you feel more thirsty because you are passing so much liquid.	·! Even when you take water pills, you need to control your salt and water intake.
Medication, Dose, and Frequency	**Type of Medication**	**What this Medication Does**	**Side Effects**	**Comments**

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Appendix B: Weight and Symptoms Log

HEART FAILURE PATIENT WEIGHT AND SYMPTOM LOG

PATIENT NAME_____ **DISCHARGE DATE**_____

WHAT TO DO: Weigh yourself every day, at the same time wearing the same amount of clothing. Check any symptoms you have that day. Notify your doctor or home care nurse if you have a 3 pound weight gain in one day or if you have a 5 pound weight gain in one week.

Keeping this record will help you recognize early signs of trouble. By getting help early, you may avoid trips to the emergency room or admission to the hospital.

Date	Time	Weight	Short of Breath	# of Pillows Needed to Sleep	Ankles Swelling	Shoes and Socks Feel Tighter	Limited Activity Tolerance	Comments
(Example) 10/1/2013	9:00 am	200 lbs		2	✓	✓		I felt very tired
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Appendix C: Fluid Intake Log

HEART FAILURE PATIENT LIQUID LOG

PATIENT NAME_____

YOUR DAILY FLUID ALLOWANCE IS _____ FL. OZ.

USE A MEASURING CUP AND RECORD ALL LIQUIDS YOU TAKE. Any food that will become liquid at room temperature is a fluid. Count ice, coffee, soda, milk, yogurt, pudding, ice cream, gelatin, popsicles and soup. Also keep track of the water you drink when you take your medicine.

1 cup = 8 FL. OZ
½ quart = 1 pint = 2 cups = 16 FL. OZ
1 quart = 4 cups = 32 FL. OZ

DATE	LIQUID TAKEN	FL. OZ.
(Example) 10/1/2013	*1 cup of chicken noodle soup*	*8 fl. oz.*

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Appendix D: Salt Intake Log

HEART FAILURE PATIENT SODIUM LOG

PATIENT NAME_____**YOUR DAILY SALT (SODIUM) ALLOWANCE IS** _____**MG.**

RECORD ALL OF THE SALT YOU EAT. Do not add salt to your food. Read food labels. Foods marked "low salt" or "low sodium" may still have a lot of salt. There may be more than one serving in a food package. Many salt substitutes have almost as much sodium as regular salt. Talk to your doctor before using a salt substitute.

1 teaspoon salt is about 2000 mg
1 ¼ teaspoons salt is about 2500 mg

DATE	FOOD TAKEN	MG OF SODIUM
(Example) 10/1/2013 !	*1 cup of chicken noodle soup*!	*870 mg*
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