Impact of Pharmacy Student–Driven Postdischarge Telephone Calls on Heart Failure Hospital Readmission Rates: A Pilot Program

Roda Plakogiannis^{1,2}, Ana Mola², Shreya Sinha²,
Abraham Stefanidis³, Hannah Oh¹, and Stuart Katz²

Abstract

Background: Heart failure (HF) hospitalization rates have remained high in the past 10 years. Numerous studies have shown significant improvement in HF readmission rates when pharmacists or pharmacy residents conduct postdischarge telephone calls. **Objective:** The purpose of this retrospective review of a pilot program was to evaluate the impact of pharmacy student–driven postdischarge phone calls on 30- and 90-day hospital readmission rates in patients recently discharged with HF. **Methods:** A retrospective manual chart review was conducted for all patients who received a telephone call from the pharmacy students. The primary endpoint compared historical readmissions, 30 and 90 days prior to hospital discharge, with 30 and 90 days post discharge readmissions. For the secondary endpoints, historical and postdischarge 30-day and 90-day readmission rates were compared for patients with a primary diagnosis of HF and for patients with a secondary diagnosis of HF. Descriptive statistics were calculated in the form of means and standard deviations for continuous variables and frequencies and percentages for categorical variables. **Results:** Statistically significant decrease was observed for both the 30-day ($P = .006$) and 90-day ($P = .007$) readmission periods. Prior to the pharmacy students' phone calls, the overall group of 131 patients had historical readmission rates of 24.43% within 30 days and 38.17% within 90 days after hospital discharge. After the postdischarge phone calls, the readmission rates decreased to 11.45%, for 30 days, and 22.90%, for 90 days. **Conclusion:** Postdischarge phone calls, specifically made by pharmacy students, demonstrated a positive impact on reducing HF-associated hospital readmissions, adding to the growing body of evidence of different methods of pharmacy interventions and highlighting the clinical impact pharmacy students may have in transition of care services.

Keywords

heart failure, clinical pharmacy services, education, telephone calls, hospital readmission rates

Introduction

Despite the advances in the treatment of heart failure (HF), readmission rates for HF as a primary and secondary diagnosis have remained stagnant in the past decade.¹ Per the National Center for Health Statistics and Veteran Affairs, HF hospitalization rates have not decreased in the past 10 years, with a rise in hospitalization rates for patients who are older than 85 years.^{2,3} Frequent rehospitalizations increase hospital costs and presumably reduce the patient's quality of life. As part of the 2010 Patient Protection and Affordable Care Act, the Centers for Medicare and Medicaid Services established readmission penalties that impact reimbursement rates for hospitals with HF readmission rates within 30 days of hospital discharge. Readmission rates can be monitored as a metric of how often patients are readmitted to the hospital shortly after being discharged and are commonly used as a measure of

hospital care.⁴ Therefore, readmission rates have become surrogate markers for the quality of care HF patients receive during their course of postacute care.

To decrease readmissions, improve patient quality of care, and lower costs, a framework of the Triple Aim,⁵ the American College of Cardiology and the American Heart Association have published guidelines on readmission reduction strategies to prevent HF readmissions. These professional associations recommend that HF patients discharged from the hospital have

¹Arnold & Marie Schwartz College of Pharmacy, Brooklyn, NY, USA

²NYU Langone Health, New York City, USA

³St. John's University, Queens, NY, USA

Corresponding Author:

Roda Plakogiannis, Arnold & Marie Schwartz College of Pharmacy,

1 University Plaza, Brooklyn, NY 11201, USA.

Email: roda.plakogiannis@liu.edu

a follow-up visit within 7 to 14 days after hospital discharge. Multidisciplinary HF disease management programs are also recommended in patients with high risk of readmission.⁶

A bundle of care transitions and coordination services, including medication reconciliation, education and counseling about disease progression and medications, symptom management, and a heart healthy diet by HF Care Transitions Teams (HFCTT) are being implemented nationwide to lower the readmission rates and improve quality of care of HF patients. Gattis et al⁷ demonstrated a significant decrease in the incidence of all-cause mortality and HF events ($P = .005$), with the addition of a clinical pharmacist to the interdisciplinary team. The clinical pharmacist was tasked to ask the patient 10 questions focusing on medication therapy, adherence, and adverse events, in addition to addressing the patient's HF status and providing detailed medication counseling. Consequently, the clinical pharmacist provided therapeutic recommendations to the patient's provider, with emphasis on optimizing the patient's HF therapy and assuring medication safety. These patients were followed up with telephone calls by the pharmacist, at weeks 2, 12, and 24. This study was one of the first to highlight the benefit of having a clinical pharmacist as a member of the multidisciplinary HF team. Subsequent studies have demonstrated that patient groups with pharmacist involvement receive more evidence-based therapies, attain target doses,^{8,9} increase medication adherence,^{10,11} reduce rates of rehospitalization,^{8,11-13} reduce mortality,^{7,13} and reduce hospital costs.⁸

Medication counseling and reconciliation is an important component in all facets of delivering pharmacy service, with the goal of optimizing medication therapy and safety. However, medication counseling and reconciliation is often inadequately delivered due to time and cost constraints. This is evident of American Society of Health System Pharmacists (ASHP) national survey,¹⁴ demonstrating the limited pharmacist involvement (45%) in medication counseling. To increase pharmacy medication discharge counseling and reconciliation, in addition to facilitating in the patient transition of care, pharmacy students may serve as an invaluable asset to the institution and patient care. To date, there appears to be no literature evaluating the impact of pharmacy student-driven postdischarge telephone calls on HF readmission rates.

The purpose of this retrospective analysis was to evaluate the 30- and 90-day hospital readmission rates in patients recently discharged with HF, who received a postdischarge telephone call by a pharmacy student to review medications and HF symptoms, and perform a detailed medication reconciliation and counseling.

Methods

In 2013, NYU Langone Health, a 730-bed academic hospital, established a transdisciplinary HFCTT comprised of nurse practitioners (NPs), a social worker, a PharmD, and 6-year pharmacy students. The role of the NPs was to consult

inpatients admitted with a HF diagnosis, identified as high risk for hospital readmission, to collaborate with the hospital primary team in optimizing the HF—American Heart Association Get with Guidelines Quality Program. Patients were categorized as high risk if they had frequent HF (or related cause) admissions in the past 6 months, lived alone, prescribed high-risk medications, had a fair or poor self-health perception, or fair or poor health literacy. The main goals were to maximize the patient's diuretic management and promote the prescribing of beta blockers, angiotensin-converting-enzyme inhibitors, and aldosterone antagonists when appropriate during the patient's hospitalization. The social worker provided the patient and the caregiver with the necessary support for a smooth transition into the community. The pharmacy student called the patient after the hospital discharge and reviewed the medications, HF symptoms, and performed a detailed medication reconciliation and counseling. The pharmacy students were in their last professional year undergoing a 5-week ambulatory care advanced pharmacy practice experience (APPE). The pharmacy students were trained and supervised by their preceptor (faculty-PharmD) until the preceptor deemed that they had adequate level of proficiency to conduct the calls independently. The students were each provided with scripted interview questions, developed by pharmacy and approved by the transdisciplinary HFCTT, to assure the uniformity of the questions asked by each pharmacy student. The list of interview questions were targeted in evaluating patient's knowledge, including indication for therapy, dose, and duration; evaluating the patient's health outcomes (weight and shortness of breath) post discharge; reinforcing the signs and symptoms of fluid overload; ensuring adherence to a follow-up appointment with their cardiologist and/or provider within 2 weeks of hospital discharge; advising on dietary restrictions; performing a medication reconciliation; and reinforcing medication adherence. The telephone call was later documented as a telephone encounter in the patient's medical chart. Students were encouraged to conduct the telephone call interview within 14 days of the patient's hospital discharge. Literature has demonstrated the timing of the phone call may be as early as 24 hours to 30 days after hospital discharge.^{15,16}

Six months after the inception of the pilot program, a retrospective manual chart review was conducted by a fifth-year pharmacy student undergoing a research elective. For each patient, the student conducted chart reviews and collected the following information: age, gender, ethnicity, hospital discharge date, whether HF was listed under reason for readmission or under the patient's problem list, date of when the pharmacy student made the telephone call, number of days between the patient's hospital discharge and the student telephone call, and historical hospital readmission(s) within 30 and 90 days before patients' hospital discharge and post student phone call hospital readmission(s) within 30 and 90 days after the patients' hospital discharge.

Table 1. Patients' Demographic Characteristics.

Characteristics	Mean % (n/N)
Age	72 years
Sex	
Male	57.25% (75/131)
White	71% (93/131)
Primary diagnosis of HF	48.85% (64/131)
HFrEF	48% (63/131)
Hyperlipidemia	50.38% (66/131)
Length of stay	7 days

Note. HF = heart failure, HFrEF = heart failure reduced ejection fraction.

Table 2. Paired Tests for the Percentage Differences Between "Historical Readmissions" and "Post Phone Call Readmissions" for All Patients.

		Historical readmissions		Post phone call readmission		Paired differences
		Mean	SD	Mean	SD	
1	30-day period ^a	.24	.43	.11	.32	-.13**
2	90-day period ^a	.38	.49	.23	.42	-.15**

Note. n = 131.

^a0 = no readmission, 1 = readmission.

p* ≤ .05. *p* ≤ .01. ****p* ≤ .001.

Statistical Analysis

Descriptive statistics were calculated in the form of means and standard deviations for continuous variables and frequencies and percentages for categorical variables. We employed 4 dichotomous variables to measure the tested relationships. To compare readmissions after patients' hospital discharge, we used the following dichotomous variables: historical readmission within 30 days (0 = no readmission, 1 = readmission), historical readmission within 90 days (0 = no readmission, 1 = readmission), post phone call readmission within 30 days (0 = no readmission, 1 = readmission), and post phone call readmission within 90 days (0 = no readmission, 1 = readmission). The primary endpoint was analyzed comparing readmission rates within 30 days after the hospital discharge. For the comparison of the differences between the dichotomous variables ("historical readmissions" and "post phone call readmissions"), we used the nonparametric McNemar test. We performed this analysis twice, based on a 30-day readmission period and a 90-day readmission period. For the secondary endpoints, historical and post phone call 30-day and 90-day readmission rates were compared for patients with a primary diagnosis of HF and for patients with a secondary diagnosis of HF.

Results

One hundred forty-three patients completed the telephone interview, between July 2014 and June 2015, conducted by a

total of 25 pharmacy students. Twelve patients were excluded from the analysis because they were not admitted as inpatients, but were admitted to the observation unit, as this analysis focused on readmission rates for the inpatient population. Baseline characteristics are outlined in Table 1.

For the entire sample of the 131 patients, the mean number of days from discharge to the pharmacy student's phone call was 17.78 (SD = 12.28), whereas the median value and range were 14 and 60 days, respectively. For the 64 patients with a primary diagnosis of HF, the mean number of days from discharge to the pharmacy student's phone call was 17.48 (SD = 10.96), whereas the median value and range were 14 and 44 days, respectively. For the 67 patients with a secondary diagnosis of HF, the mean number of days from discharge to the pharmacy student's phone call was 18.06 (SD = 13.51), whereas the median value and range were 14 and 60 days, respectively.

Primary Outcome

The results of the analysis are presented in Table 2. Statistically significant differences were observed for both the 30-day (*P* = .006) and 90-day (*P* = .007) readmission periods. Prior to the pharmacy students' phone calls, the overall group of 131 patients had a historical readmission rate of 24.43% within 30 days after the hospital discharge, and a readmission rate of 38.17% within 90 days after the hospital discharge. After the postdischarge phone calls, the readmission rate decreased to 11.45%, for 30 days, and 22.90%, for 90 days (Table 2).

To confirm the robustness of the results, we examined lack of observed significance attributable to the sample sizes, conducting 2 post hoc power analyses,¹⁷ based on the percentages differences corresponding to the 30-day and 90-day comparisons. The post hoc power analysis in the first case revealed that for α equal to 0.05, the power of the statistically significant difference was 0.91. Also, the post hoc power analysis in the second case revealed that for α equal to 0.05, the power of the statistically significant difference was 0.90.

Secondary Outcome

We further analyzed the subgroup of 64 patients with a primary diagnosis of HF and found the 30-day readmission rate decreased from 15.63% to 10.94%, and the 90-day readmission rate decreased from 29.69% to 23.44%, after the student phone call. We statistically assessed these differences, but the McNemar test did not render any significant differences (Table 3).

The remaining 67 patients were categorized as having a secondary diagnosis of HF. Based on their medical history, they had a historical readmission rate of 32.84% within 30 days and 46.27% within 90 days. After the pharmacy students' phone calls, these 67 patients had a statistically significant lower 30-day readmission rate of 11.94% (*P* = .001) and a statistically significant lower 90-day readmission rate of 22.39% (*P* = .002) (Table 4). The post hoc power analysis for the 30-day readmission rates revealed that for α equal to

Table 3. Paired Tests for the Percentage Differences Between “Historical Readmissions” and “Post Phone Call Readmissions” for Patients With a Primary Diagnosis of Heart Failure.

		Historical readmissions		Post phone call readmission		Paired differences
		Mean	SD	Mean	SD	
1	30-day period ^a	.16	.37	.11	.32	-.05
2	90-day period ^a	.30	.46	.23	.43	-.07

Note. n = 131.

^a0 = no readmission, 1 = readmission.

*p ≤ .05. **p ≤ .01. ***p ≤ .001.

Table 4. Paired Tests for the Percentage Differences Between “Historical Readmissions” and “Post Phone Call Readmissions” for Patients With a Secondary Diagnosis of Heart Failure.

		Historical readmissions		Post phone call readmission		Paired differences
		Mean	SD	Mean	SD	
1	30-day period ^a	.33	.47	.12	.33	-.21*
2	90-day period ^a	.46	.50	.22	.42	-.15**

Note. n = 131.

^a0 = no readmission, 1 = readmission.

*p ≤ .05. **p ≤ .01. ***p ≤ .001.

0.05, the power of the statistically significant difference was 0.99. Accordingly, the post hoc power analysis for the 90-day readmission rates revealed that for α equal to 0.05, the power of the statistically significant difference was 0.99.

Discussion

Telephone calls post hospital discharge have been widely utilized as transition of care to provide patient education, perform medication reconciliation, and address patient concerns. Salas et al¹⁸ conducted a 6-month prospective, single-center, pilot study evaluating the impact on hospital readmission rates of a pharmacy resident who managed a HF care transitions service. Unlike our pilot program, which was student-driven, and only conducted telephone calls, the pharmacy resident in this study was to provide patient education, optimize medication regimen, ensure attainment of discharge medications, and follow up with the patient via a telephone call within 5 days of discharge. This service demonstrated a numerical reduction (28.1%-16.6%) in the 30-day HF hospital readmissions, but not significance.

Dudas et al¹⁹ conducted a randomized controlled trial to evaluate the impact of a pharmacist-driven postdischarge telephone call, on 30-day HF hospital readmission rates and patient satisfaction. This study demonstrated pharmacist-driven postdischarge calls, within 2 days of hospital discharge, demonstrated HF hospital readmission rates at 30 days (15% in the phone call

group vs 25% in the no phone call group, $P = .07$). The patient satisfaction surveys demonstrated significantly higher satisfaction in the phone call group (86% very satisfied vs 61% very satisfied in the no phone call group, $P = .007$).

Previous studies have demonstrated a positive impact of pharmacy involvement in the different elements of HF Care Transitions.¹⁸⁻²¹ A Cochrane systematic review of 25 randomized controlled trials of disease management programs post hospital discharge (5,942 subjects) have demonstrated that multidisciplinary care defined as multiple services by various care providers, including pharmacists, improved early (within 6 months) and late (12 months) HF rehospitalization. Interventions that involved telephone follow-up demonstrated a reduction in all-cause mortality at 12 months, odds ratio = 0.66 (95% confidence interval, 0.47-0.91).²²

Similarly, our retrospective study of student-driven post-discharge phone calls demonstrated statistically significant decrease for both the 30- and 90-day hospital readmission rate after hospital discharge in comparison with the historical 30- and 90-day readmission rates (control group) after hospital discharge. Furthermore, the patients with a secondary diagnosis of HF demonstrated significantly lower 30-day and 90-day readmission rates after hospital discharge. Blecker et al¹ reported that primary HF hospitalizations have slightly declined; however, the rates of hospitalizations with a secondary diagnosis of HF have been stable. This highlights the opportunity to implement readmission reduction strategies to reduce the burden of HF patients with both cardiac disease and noncardiac conditions, such as pulmonary disease, renal failure, and infections.¹

Of note, the inherent weaknesses of a retrospective analysis via a manual chart review and the variety of pharmacy students conducting the postdischarge telephone calls may be viewed as limitations.

ASHP national survey points out the lack of pharmacist providing medication discharge counseling.¹⁴ A major hindering factor in pharmacists conducting medication discharge counseling is the time and cost constraints. Therefore, utilizing sixth-year pharmacy students undergoing their APPE may serve as a *triple* benefit, to the patient, for evident reasons, to the hospital, because of reduction in HF readmission rates, and to the student, who gains an invaluable learning experience. To our knowledge, this is the first study evaluating the impact of student-driven postdischarge telephone calls on HF readmissions, highlighting the positive effect pharmacy students' services have on HF patient readmission rates.

Conclusion

Postdischarge phone calls, specifically made by pharmacy students, demonstrated a positive impact on reducing HF-associated hospital readmissions, adding to the growing body of evidence of different methods of pharmacy interventions and highlighting the clinical impact pharmacy students may have in transition of care services.

Declaration of Conflicting Interests

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References

1. Blecker S, Paul M, Tksler G, Ogedegbe G, Katz S. Heart failure associated hospitalizations in the United States. *J Am Coll Cardiol*. 2013;61(12): 1259-1267.
2. Hall MJ, Levant S, DeFrances CJ. *Hospitalization for congestive heart failure: United States, 2000-2010. NCHS Data Brief*. 2012;108:1-8.
3. Shah RU, Tsai V, Klein L, Heidenreich PA. Characteristics and outcomes of very elderly patients after first hospitalization for heart failure. *Circ Heart Fail*. 2011;4:301-307.
4. Robinson S, Howie-Esquivel J, Vlahov D. Readmission risk factors after hospital discharge among the elderly. *Popul Health Manag*. 2012;15(6):338-351.
5. Berwick DM, Nolan TW, Whittington J. The triple aim: care, health, and cost. *Health Aff*. 2008;27(3):759-769.
6. Yancy CW, Jessup M, Bozkurt B, et al. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association task force on practice guideline. *J Am Coll Cardiol*. 2013;62(16):E147-E239.
7. Gattis WA, Hasselblad V, Whellan DJ, et al. Reduction in heart failure events by the addition of a clinical pharmacist to the heart failure management team: results of the Pharmacist in Heart Failure Assessment Recommendation and Monitoring (PHARM) Study. *Arch Intern Med*. 1999;159(16):1939-1945.
8. Whellan DJ, Gauden L, Gattis WA, et al. The benefit of implementing a heart failure disease management program. *Arch Intern Med*. 2001;161(18):2223-2228.
9. Martinez AS, Saef J, Paszczuk A, et al. Implementation of a pharmacist-managed heart failure medication titration clinic. *Am J Health Syst Pharm*. 2013;70(12):1070-1076.
10. Goodyer LI, Miskelly F, Milligan P. Does encouraging good compliance improve patients' clinical condition in heart failure? *Br J Clin Pract*. 1995;49(4):173-176.
11. Varma S, McElnay JC, Hughes CM, et al. Pharmaceutical care of patients with congestive heart failure: interventions and outcomes. *Pharmacotherapy*. 1999;19(7):860-869.
12. Roughead EE, Barratt JD, Ramsay E, et al. The effectiveness of collaborative medicine reviews in delaying time to next hospitalization for patients with heart failure in the practice setting: results of a cohort study. *Circ Heart Fail*. 2009;2(5):424-428.
13. López CC, Falces SC, Cubí QD, et al. Randomized clinical trial of a postdischarge pharmaceutical care program vs regular follow-up in patients with heart failure. *Farm Hosp*. 2006;30(6):328-342.
14. Pedersen CA, Schneider PJ, Scheckelhoff J. ASHP national survey of pharmacy practice in hospital settings: prescribing and transcribing—2016. *Am J Health Syst Pharm*. 2017;74(17):1336-1352.
15. Harrison MB, Browne GB, Roberts J, Tugwell P, Gafni A, Graham ID. Quality of life of individuals with heart failure: a randomized trial of the effectiveness of two models of hospital to home transition. *Med Care*. 2002;40:271-282.
16. Pugh LC, Tringali RA, Boehmer J, et al. Partners in care: a model of collaboration. *Holist Nurs Pract*. 1999;13:61-65.
17. Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods*. 2007;39(2):175-191.
18. Salas CM, Miyares MA. Implementing a pharmacy resident run transitions of care service for heart failure patients: effect on readmission rates. *Am J Health Syst Pharm*. 2015;72:S43-S47.
19. Dudas V, Bookwalter T, Kerr KM, Pantilat SZ. The impact of follow-up telephone calls to patients after hospitalization. *Am J Med*. 2001;111(9B):26S-30S.
20. Eggink RN, Lenderink AW, Widdershoven JW, van der Bermt PM. The effect of a clinical pharmacist at discharge service on medication discrepancies in patients with heart failure. *Pharm World Sci*. 2010;32(6):759-766.
21. Szkiladz A, Carey K, Ackerbauer K, Heelon M, Friderici J, Kopcza K. Impact of pharmacy student and resident-led discharge counseling on heart failure patients. *J Pharm Pract*. 2013;26(6):574-579.
22. Takeda A, Taylor SJ, Taylor RS, Khan F, Krum H, Underwood M. Clinical service organization for heart failure. *Cochrane Database Syst Rev*. 202;9:CD002752.