Evaluation of a Pharmacist-Managed Heart Failure Education Project: Empowering Patients to Self-Manage Their Disease

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Abstract

Background: Recent reimbursement cuts for hospitals with higher 30-day heart failure (HF)-related readmission rates call for means of reducing those readmissions. **Objective:** To determine if pharmacist-initiated education increases HF knowledge and assess if an increase in HF knowledge decreases HF readmission. **Methods:** This was a prospective interventional study. Participants were ≥ 18 years old admitted through the emergency department of a 322-bed community hospital with a diagnosis and/or past medical history of HF. Terminal/palliative care patients, patients residing in an assisted-living environment, or patients with a mental illness that deemed them incapable of participating were excluded. Forty-eight patients received pharmacist-initiated HF education on HF pathophysiology and its pharmacologic and nonpharmacologic treatment. Medication assistance and ancillary services were consulted when necessary. Patients' knowledge of HF was assessed using the same questionnaire prior to education and through a follow-up phone call within 7 days postdischarge. **Results:** Posteducation HF knowledge scores were 13.7 points higher than preeducation scores ($P < .05$). Twenty-five patients (52%) had HF as a primary discharge diagnosis. Of those patients, 9 (36%) were readmitted within 30 days for any cause. Only 3 patients (12%) had a HF-related diagnosis at readmission. There was a statistical difference in the level of knowledge but that was not translated into a statistical difference in readmission rates. **Conclusion:** Patients' HF knowledge scores increased after pharmacist education. Improvements in HF knowledge could not be correlated with readmission rates. However, the majority of HF patients in this study did not have a HF-related diagnosis at the time of readmission.

Keywords

pharmacotherapy, education, heart failure, congestive heart failure, pharmacist, knowledge

Background

Heart failure (HF) is a clinical syndrome caused by the inability of the heart to pump sufficient blood to meet the metabolic needs of the body.¹ Approximately 5.8 million people in the United States have HF with around 670 000 new diagnoses each year.² It is predicted that direct medical costs and indirect costs for HF patients in the United States will reach 11.3 and 32.4 billion dollars, respectively, in 2015.³ Following a HF-related admission, as many as 44% of patients are readmitted due to disease progression, sub-optimal medication management or nonadherence, insufficient discharge planning, reduced level of health literacy, environmental factors, and non-HF-related comorbidities.⁴

Traditionally, hospitals have been responsible for care during hospitalizations and discharge planning. Following-up with the patient postdischarge is a rarity among hospitals. However, a continuum of care into the outpatient setting can influence readmission rates and should be evaluated by

hospitals. Health care facilities have initiated programs to educate patients to help self-manage patients' morbidities, specifically HF. Such programs have been successful in improving patients' knowledge and self-care abilities and allow patients to move from an acute event to the effective self-management of a chronic disease.^{5,6} The American College of Clinical Pharmacy Cardiology Practice and Research Network has published a Best Practices Model for discharge counseling for patients with HF. The model describes a patient-centered approach that includes ensuring key disease management concepts are adequately conveyed to patients and their families, intensive discharge counseling

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and follow-up care, discharge planning that ensures adherence with evidence-based therapies, and teaching sessions that involve discharge instructions. The model also focuses on barriers such as health literacy and financial hardships. Education should include information on the disease state (ie, risk factors, complications, and signs and symptoms of exacerbation), proper medication use, a postdischarge plan for follow-up, interventions for controlling HF, and lifestyle modifications.⁷ This model provided recommendations that were feasible in our setting and allowed the use of available resources. This report comes in lieu of recent Centers for Medicaid and Medicare Services (CMS) reimbursement cuts for HF readmissions. Beginning October 1, 2012, CMS decreased payment by 1% of the market value for acute care hospitals with higher than expected readmission rates for certain conditions, including HF.⁸ This left hospitals scrambling to find methods to decrease HF-related readmissions. This is especially important in a patient population that has a 28.4% readmission rate, a rate above the state and national average.⁹ The purposes of this study were to determine if the initiation of a pharmacist-managed education session increases HF knowledge and to assess if an increase in HF knowledge decreases HF-related readmission rates.

Methods

This prospective study was approved by the institutional review board and was conducted at a 322-bed, acute-care, community hospital from October 2012 through April 2013 as a PGY-1 pharmacy residency project. The daily patient census was reviewed to identify HF patients. Patients ≥ 18 years of age admitted through the emergency department (ED) with a diagnosis and/or past medical history of HF were included. All participants signed an informed consent to take part in the study. Terminal/palliative care patients, patients residing in an assisted-living environment, or patients with a diagnosis of a mental illness that deemed them incapable of participating were excluded.

The study consisted of HF education provided by a pharmacist and assessment of patients' knowledge of HF prior to and after education. One resident clinical pharmacist conducted all the education sessions. Each education session took place in the patient's room and lasted approximately 30 minutes. Patients were counseled on all of their current medications including indication, compliance, and side effects. Counseling also included smart food choices and instructions in the event patients became symptomatic or gained weight. Patient knowledge of HF prior to and after education was assessed using a 15-question validated questionnaire available from current literature¹⁰ and after modification to suit our study. On administering the questionnaire to the first 2 patients, we noticed a lack of comprehension due to the wording. Slight vocabulary changes were then made to help our study population better

comprehend the questionnaire. A letter to prescribers and local pharmacies was mailed to inform them of the study. HF education packets and informed consent forms were also created. The letter, HF education packets, and informed consent forms are all available as supplemental materials (available online at pmt.sagepub.com/supplemental). A telephone hotline was implemented for patients to call with questions or concerns. A multidisciplinary team, made up of pharmacists, nurses, social workers, and dietitians, was created. Team goals and measurement metrics were established. A patient medication assistance program and ancillary services were consulted when necessary. "Meds to Beds," a patient medication assistance program, was available to deliver a 30-day supply of the patient's discharge medications directly to their room prior to discharge at their regular insurance co-pay. A pharmacy staff member delivered the medications during business hours (8:00 AM-4:30 PM). All patients were discharged during these hours. The medication assistance program was available to help indigent patients obtain their medications prior to discharge. Dietary services were available to help patients better understand food restrictions. Patients who reported not possessing scales at home were provided with scales free of charge. Scales were funded by the PGY1 residency fund.

It was hypothesized that pharmacist-initiated HF education increases HF knowledge. Prior to providing patients with education, patients' awareness of their diagnosis, their general knowledge of HF, and lifestyle modifications was assessed using the 15-question questionnaire (Table 2). Patients were then given verbal counseling, provided with printed educational material, and given a daily weight log form. Patients were also counseled on dietary and fluid restrictions and the importance of checking their weights regularly. Patients were taught to self-monitor their weight and what to do if it increased by a certain amount per day and per week. Symptoms of worsening HF were also described with details about what to do and when to see a doctor. Posteducation scores were then assessed using the same questionnaire via telephone within 7 days of discharge from the hospital. The follow-up phone call also ensured patients understood the education material discussed, had their medications prescribed to them at discharge, had a follow-up appointment with their primary care physician scheduled, and answered any remaining questions. Patients were asked if they were able to obtain their medication since their hospital visit and if they understood how to take it. All the patients that completed the postdischarge phone call said they were able to obtain their medications and had a follow-up appointment scheduled. None of the patients had been to their appointment at the time of the phone call.

To estimate the probability of patients' 30-day readmission, each patient's LACE (Length of stay, Admission, Comorbidity, Emergency room visits during previous 6 months) score was calculated.¹¹ The LACE score is the

expected probability of readmission or death within 30 days after discharge. This index can be used to help identify patients who may benefit from more intensive postdischarge care.¹²

The differences in pre- and post-HF education scores were compared with a 2-tailed paired *t* test, while time to readmission after discharge was analyzed with Kaplan–Meier survival analysis using GraphPad Prism version 5.04.¹³ Patient demographics were summarized using descriptive statistics. The relationship between education scores and readmission rates was assessed by logistic regression using statistics software R3.0.1.

Results

Patient Demographics/Clinical Characteristics

A total of 48 patients fulfilled study criteria and consented to participate. Patient demographics and clinical characteristics and a partial listing of their medications are presented in Table 1. The average LACE score for all patients was 26 ± 7 (Table 1). As LACE scores range from a minimum of 2% to a maximum of 47.3%, a score of 26% in this study indicates that the study participants were at increased risk of readmission.¹²

HF Knowledge Scores

Patients' pre- and posteducation responses to the questionnaire are shown in Table 2. Pharmacist-initiated HF education increased the average education score by 13.7 points above baseline ($76.4 \pm 13.8\%$ preeducation vs $90.1 \pm 6.8\%$ posteducation; $P < .05$). Among the study participants, 30 patients (62.5%) stated that their clinical condition had never been clearly explained to them in the preeducation questionnaire, while 25 of those same patients (83.3%) stated that their condition had been clearly explained to them in the posteducation questionnaire, indicating that the education provided changed patients' awareness of their HF. The other 5 patients (16.7%) did not answer the posteducation questionnaire. When asked how often HF patients should weigh themselves, 33 of the 48 patients (68.8%) answered daily and 15 patients (31.3%) answered something other than daily in the preeducation questionnaire. In the posteducation questionnaire, 5 of those 15 patients answered daily, and 6 patients still answered something other than daily. The remaining 4 patients did not answer the posteducation questionnaire. This suggests that some patients understood the importance of daily weight measurements while others need reinforcement. Education scores between patients readmitted within 30 days and those that were not were also examined. The average preeducation score was $79.1 \pm 7.7\%$ for patients readmitted within 30 days compared with $74.1 \pm 17.2\%$ for patients not

Table 1. Demographics and Clinical Characteristics of Patients Participating in the Pharmacist-Managed Heart Failure Initiative.

Age (years)	
Median	69
IQR	57.8-75.5
Sex, n (%)	
Female	22 (45.8)
Male	26 (54.2)
Race, n (%)	
Caucasian	45 (93.8)
African American	3 (6.2)
HF as primary diagnosis at discharge, n (%)	25 (52)
Comorbidities, n (%) ^a	
Diabetes	33 (68.8)
Previous CAD	24 (50)
LACE score (%)	
Mean	26
SD	7
Ejection fraction (EF) $\leq 40\%$, n (%)	
Total	21 (43.8)
On ACEI or ARB	6 (28.6)
Not on ACEI or ARB	15 (71.4) ^b
Medications, n (%) ^a	
Digoxin	7 (14.6)
Beta-blocker	36 (75.0)
Loop diuretic	38 (79.2)
ACE inhibitor/ARB	17 (35.4)

Abbreviations: IQR, interquartile range; ACEI, angiotensin-converting enzyme inhibitor; ARB, angiotensin II receptor blocker; SD, standard deviation; CAD, coronary artery disease.

^aNot a complete listing.

^bOnly 3 of those 15 patients did not have a documented contraindication.

readmitted within 30 days (Table 3). The average posteducation scores were $90.9 \pm 6.1\%$ and $89.6 \pm 7.4\%$ for patients readmitted within 30 days and patients not readmitted within 30 days, respectively. The results indicate that education scores increased in both sets of patients.

Thirty-Day Readmissions

To measure 30-day readmission rates, study participants were followed until readmission or for 30 days, whichever occurred first. Patients that were not readmitted within 30 days were censored. Time to readmission regardless of discharge and readmission diagnoses is presented in Figure 1. Overall, regardless of discharge diagnosis, 22 patients (45.8%) were readmitted within 30 days. Among them, 6 (27.3%) were readmitted with a HF-related diagnosis and 16 (72.7%) with a non-HF-related admission diagnosis (Figure 2). About 3 times as many patients were readmitted for non-HF-related diagnoses such as chronic bronchitis, atrial fibrillation, and hypotension compared with HF-related diagnosis.

Table 2. Heart Failure Knowledge Pre- and Post-HF Education.

Questions	Number of Respondents		P Value
	Preeducation (n = 48)	Posteducation (n = 39) ^a	
<i>Awareness</i>			
1. Do you have heart failure diagnosed by a health professional?	42 (87.5%)	39 (100%)	.07
2. Do you think your clinical condition has ever been clearly explained to you? ^b	18 (37.5%)	39 (100%)	<.0001
3. Do you know what you need to do at home to keep your heart failure under control? ^b	18 (37.5%)	33 (84.6%)	<.0001
4. Do you know how to monitor your heart failure and can detect problems before they get too bad? ^b	18 (37.5%)	30 (76.9%)	.001
5. If your heart failure gets worse, do you feel scared and want to visit the Emergency Department right away?	12 (25%)	11 (28.2%)	.55
<i>Heart failure knowledge</i>			
6. What is the best definition of heart failure?	12 (25%)	9 (23.1%)	.72
7. What are the symptoms of heart failure? Mark all that apply:			
a. Dyspnea (shortness of breath)	45 (93.8%)	39 (100%)	.25
b. Edema (swelling, weight gain)	42 (87.5%)	39 (100%)	.25
c. Fatigue (tired, weak)	43 (89.6%)	39 (100%)	.13
d. Chest pain or palpitations (strong, fast heartbeat)	40 (83.3%)	39 (100%)	.02
8. I am going to read you a list of conditions and I want you to tell me if each one is a sign your heart failure is getting worse.			
a. Is shortness of breath a sign your heart failure is getting worse?	45 (93.8%)	39 (100%)	.25
b. Is increased swelling of your legs or ankles a sign your heart failure is getting worse?	43 (89.6%)	38 (97.4%)	.25
c. Is waking up at night short of breath a sign your heart failure is getting worse?	37 (77.1%)	34 (89.5%)	.29
d. Is feeling more tired than usual a sign your heart failure is getting worse?	42 (87.5%)	39 (100%)	.07
e. Is weight gaining a sign your heart failure is getting worse? ^b	37 (77.1%)	36 (92.3%)	.08
<i>Lifestyle modifications</i>			
1. There are many things you can do on your own, other than medications, to prevent your heart failure from getting worse. I am going to read a list of things and I want you to tell me which ones are important to prevent your heart failure from getting worse. (Check all that apply.) This is not what you do at home, but what you think a person with heart failure should do.			
a. Restrict salt intake (cut back on salt)	47 (98%)	39 (100%)	1
b. Restrict fluid intake (cut back on fluids) ^b	38 (79.2%)	39 (100%)	.04
c. Daily weight checks (check your weight daily) ^b	41 (85.4%)	39 (100%)	.04
d. Medication compliance (take medications as prescribed)	45 (93.8%)	39 (100%)	.48
e. Daily exercise (keep in shape, regular exercise)	46 (95.8%)	39 (100%)	1
f. Abstain from smoking (stop smoking)	46 (95.8%)	39 (100%)	.48
g. Abstain from alcohol (stop/cut back on drinking)	46 (95.8%)	39 (100%)	.48
10. Which of the following foods contain a lot of salt? (regular version of foods, not low-sodium). Check all that apply.			
a. Hot dogs	44 (91.7%)	39 (100%)	1
b. Canned vegetables	40 (83.3%)	38 (97.4%)	.48
c. Cheese ^b	34 (70.8%)	37 (94.9%)	.01
d. Pickles	41 (85.4%)	37 (94.9%)	.48
e. Tomato juice	46 (95.8%)	38 (97.4%)	n/a
f. Canned soup	45 (93.8%)	39 (100%)	1
11. During the past 6 months ^c have you taken specific steps to eat foods that are low in salt?	43 (89.6%)	37 (94.9%)	.62
12. During the past 6 months ^c have you taken specific steps to limit your intake of fluids? ^b	30 (62.5%)	35 (89.7%)	.01
13. Do you have a scale at home that works correctly?	37 (77.1%)	33 (84.6%) ^d	.37
14. How often do you weigh yourself? ^b	14 (29.2%)	22 (56.4%)	.02
15. How often should someone with heart failure weigh himself or herself?	33 (68.8%)	30 (76.9%)	.72

^aOut of the 48 patients that participated in the study, 9 patients did not respond to the posteducation questionnaire (2 patients declined to participate, 2 patients were deceased, 2 patients were discharged to the nursing home and were unable to participate, and 3 patients could not be reached).

^bP < .05, McNemar's test with continuity correction.

^cThe posteducation question asked about fluid restriction since the patient had been home.

^dScales were provided to patients beginning in January 2013.

Table 3. Preeducation versus Posteducation Scores^a in Patients Readmitted Within 30 Days and Patients Not Readmitted Within 30 days.

Readmission Status	Preeducation (n)	Posteducation (n)	% Change	P Value
Readmitted within 30 days	79.1 ± 7.7% (22) [#]	91.1 ± 6.1% (16) ⁺	15	<.0001
Not readmitted within 30 days	74.1 ± 17.2% (26)	89.6 ± 7.4% (23)	21	.001

^aData presented as mean ± standard deviation (n); n = number of patients.

[#]Preeducation score between patients readmitted within 30 days and those not readmitted, *P* = .22.

⁺Posteducation scores between patients readmitted within 30 days and those not readmitted, *P* = .50.

Figure 1. Effect of pharmacist-directed education on 30-day readmissions in heart failure patients.

Taking discharge diagnosis into account, 25 of the 48 patients (52%) had HF as a primary discharge diagnosis (Figure 2). These patients will contribute to the 30-day HF readmission rate if they are readmitted within 30 days for any reason. Of those 25 patients, 9 patients were readmitted within 30 days, making the current, all-cause readmission rate 36% for this subset of patients (Figure 2). Only 3 of those 25 patients were readmitted with a HF-related diagnosis, making the HF-related readmission rate 12% for this subset of patients (Figure 2). Other readmitting diagnosis included encephalopathy, diarrhea, chronic bronchitis, shortness of breath, cholecystitis, and altered mental status. Logistic regression did not reveal a significant relationship between education scores and readmission rate.

Discussion

Recent CMS guidelines are affecting reimbursement for hospitals with higher than expected 30-day readmission.⁸ The current study was undertaken to increase patients' knowledge of their heart failure and reduce their 30-day readmission. Patients' HF knowledge scores increased

Figure 2. Readmission percentage of patients discharged with a primary diagnosis of HF versus patients with a discharge diagnosis other than HF.

*12% (3 of 25) of patients with HF as a primary discharge diagnosis were readmitted with a HF-related diagnosis.

**13% (3 of 23) of patients with a primary discharge other than HF were readmitted with a HF-related diagnosis.

from 76.4 ± 13.8% before education to 90.1 ± 6.8% after education. The 30-day readmission rate was 45.8% regardless of discharge diagnosis. The majority of patients were readmitted with a non-HF-related admission diagnosis suggesting that other comorbidities should be addressed to impact readmission. Due to patients' high LACE score (26 ± 7), the stratification of patients, who may benefit from more intense education could not be evaluated. Improvements in HF knowledge did not significantly affect readmission rates, possibly due to the sample size. However, the majority of HF patients readmitted within 30 days did not have a HF-related diagnosis at the time of readmission (72.7%). Patients were able to increase their HF knowledge, but may not have been able to translate that into self-care practices at home. Other studies in HF patients had similar results, reporting improvement in HF knowledge without significant improvements in readmission rates.¹⁴⁻¹⁹ One study proposed that low health literacy was significantly associated with a higher rate of 30-day postdischarge hospital utilization. According to the National Assessment of Adult Literacy, the primary county served by this hospital has a higher percent of residents lacking literacy skills compared with the state average.²⁰ Lower literacy skills likely affect health. Adults with low levels of literacy cannot read and understand much of the

public information available for prevention and treatment.²¹ Level of literacy and health literacy should help guide future educational sessions and follow-up with patients. In addition to the education provided on HF, 2 novel components of the study were the provision of scales for patients who do not possess them and the installation of a telephone hotline to help answer patients' questions. It is anticipated that this will encourage patients to take active roles in managing their HF. Since this study only followed-up with each patient via a phone call after discharge from hospital, we could not determine how much each component of our intervention may have affected his or her treatment. It is possible that the letter that was mailed out to pharmacies and prescribers informing them of the initiative may have influenced readmission by promoting early follow-up, but this was not evaluated in the study.

Analysis of time after discharge and readmission dates indicated that the majority of patients (64%) readmitted within 30 days were readmitted within the first 15 days postdischarge (Figure 1), suggesting the timing of education needs to be optimized to help reduce readmissions. Dharmarajan et al reported that HF readmissions were highest on day 2 after discharge, but remained high for the entire 30 days postdischarge. The same study also showed that after a HF admission, readmissions were mainly due to HF, but included several disease states (acute myocardial infarction and pneumonia readmissions).²² Providing education and a single follow-up phone call on HF alone may not be sufficient to decrease readmission rates. Another study was able to show a 39% decrease in readmission rates by offering education and support intervention over the phone, calling patients every 1 to 4 weeks over the course of 1 year to reinforce education and offer support.²³ Therefore, to help combat an above-national average readmission rate, more disease states should be targeted and follow-up with each patient should continue for at least 30 days postdischarge. In addition to the small sample size, other limitations include the short duration of the study and patient follow-up. It is unknown how many patients used the medication assistance program and ancillary services.

Conclusion

Although the increase in knowledge scores is gratifying, the ultimate goal is to decrease all-cause readmission of HF patients. Moving forward, HF education should be provided to all HF patients that are admitted, but educating patients on a broader range of disease states should also be considered. Expanding follow-up sessions with each patient and/or following them for the entire 30-day span may also be a consideration. The hotline is still available and HF patients are encouraged to use this service. The results of this study thus far are promising and future endeavors are anticipated to further this initiative.

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