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Impact of the Implementation of Project Re-Engineered Discharge for Heart Failure patients at a Veterans Affairs Hospital at the Central Arkansas Veterans Healthcare System

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Abstract

Background: Hospitalizations due to chronic diseases such as heart failure (HF) continue to increase worldwide. Fragmentation of care while transitioning from one care setting to another is an important factor contributing to hospitalizations. Fragmented discharge tools have been implemented; however, the impact of a comprehensive interdisciplinary discharge tool has not been previously studied. **Objective:** The goal of this study is to assess the impact of the implementation of Project Re-Engineered Discharge (RED) on the incidence of hospital readmissions, all-cause mortality, primary care physician follow-up rate, and cost savings for patients with HF. **Methods:** This was a single-center, retrospective, cohort study of patients admitted with HF exacerbation at the Central Arkansas Veterans Healthcare System (CAVHS). A random sample of 100 patients admitted prior to implementation of Project RED and 50 patients after Project RED intervention were included in the study. The primary end point was 30-day hospital readmission for HF exacerbation. The co-secondary end points were all-cause mortality, cost savings, and rate of primary care physician appointments scheduled as well as attended per postdischarge recommendations. **Results:** The 30-day hospital readmission rate was 28% in the pre–Project RED group, and it was 18% in the post–Project RED group ($P = .18$). The all-cause mortality was significantly lower in the post–Project RED group as compared with the pre–Project RED group (18% vs 41%, $P = .04$). More patients in the post–Project RED group attended an outpatient primary care appointment as recommended per postdischarge instructions (40% vs 19%, $P = .006$). In addition, with the decrease in hospital 30-day readmission rate in the post–Project RED group, there was a cost savings of $1453 per patient visit for HF exacerbation. **Conclusions:** Coordination of care using a discharge tool like Project RED should be utilized in institutions to improve patient outcomes as well as patient safety while decrease the overall health care cost.

Keywords

cardiovascular, cost effectiveness, disease management, transition of care, outcomes research

Hospital readmission has been a long-standing concern in health care. Since October 2012, the Centers for Medicare and Medicaid Services initiated the Readmission Reduction Program. With the implementation of the program, there are reduced payments to hospitals that have more 30-day readmissions compared with an established standard based on a 3-year national average, for heart attack, heart failure (HF), and pneumonia.[1] A recent study showed that 20% of Medicare beneficiaries who were discharged from a hospital were readmitted within 30 days' post discharge. Of those readmitted patients, 50% of patients did not have a bill for a visit to a physician's office between the time of discharge and rehospitalization. The study estimated the cost of unplanned rehospitalization in 2004 was $17.4 billion.[2] According to the Centers for Medicare and Medicaid Services, approximately 2.6 million older adults are readmitted to a hospital within 30 days of being discharged. The estimated cost exceeds $2.6 billion every year or more than $1000 per readmission. The Medicare Payment Advisory Commission estimates that more than three-quarters of 30-day readmissions may be preventable. Fragmentation of care while transitioning from one care setting to another is

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an important factor in rehospitalization. Improving communication and coordination of care during transitions can significantly reduce readmission rates.[1] HF is the most common indication for hospitalization due to exacerbation of a chronic condition among adults aged 65 years and older in the United States.[3] Hospitalizations due to HF have more than tripled over the past 2 decades. The annual cost associated with caring for heart patients is estimated to be nearly $20 billion and is primarily attributed to frequent hospital readmissions due to decompensation. Factors associated with readmission due to an exacerbation of HF symptoms include advanced age, prior hospital admission, increased length of hospital stay, increasing severity of illness, and medical comorbidities.[3] One in 5 hospitalizations is complicated by a postdischarge adverse event, some of which may lead to preventable emergency department visits or readmissions. In a randomized prospective study, 23% patients experienced at least 1 adverse event post discharge. Of those reported adverse events, 72% were medication related.[4] Another prospective cohort study showed similar results. They found 19% patients had adverse events after discharge and 66% of those events were drug events.[5] Project Re-Engineered Discharge (RED) was developed by a research group at the Boston University Medical Center to promote patient safety and reduce hospital readmissions by streamlining the hospital discharge process.[6] RED components consist of 12 mutually reinforcing actions employed by an interdisciplinary team throughout the hospital stay for more effective transitions at discharge. These components are follow-up medical/lab appointments, follow-up of pending test/study results, organize postdischarge services and equipment, identify correct medications and develop personalized patient plan, reconcile discharge plan with national guidelines, teach a written discharge plan to patients with list of medications, educate patient about diagnosis, assess patient's understanding, transmit discharge summary to clinicians, discharge medication counseling, and reinforcement of discharge plan.[7] A randomized trial, funded by the Agency for Healthcare Research and Quality, showed that Project RED reduces readmissions by approximately 30%. In addition, the study showed a higher primary care physician (PCP) follow-up rate (18%) in the intervention group as compared with the usual care (nonintervention group) patients. Last, there was a cost savings of about 34% ($412 per patient) in the intervention group.[8] Another intervention study with a historical control at a skilled nursing facility adapted Project RED to their transition of care. The rate of hospitalization 30 days after discharge from the skilled nursing facility for participants prior to the intervention was 18.9% and for participants after the intervention was 10.5%. In addition, more patients in the intervention group had attended an outpatient appointment within 30 days of discharge (70.5% vs 52.0%).[9] The purpose of this study is to assess the impact of the implementation of Project RED on the incidence of hospital readmissions, all-cause mortality, PCP follow-up rate, and cost savings for patients with HF at an academic Veterans Affairs hospital.

Methods

This was a retrospective, randomized, cohort study. The study was approved by Central Arkansas Veterans Healthcare System (CAVHS) Department of Veterans Affairs Institutional Review Board and CAVHS Research and Development Committee. CAVHS is a tertiary care facility, ranked as one of the largest and busiest Veterans Affairs medical centers in the country. The health system includes both inpatient (medical as well as surgical units) and outpatient services for Veterans. Current inpatient teams include hospitalists, clinical team coordinators, nurses, clinical pharmacists, dietitians, and social workers. The CAVHS Computerized Patient Recording System database was utilized for the study. Patient list with admission International Classification of Diseases, Ninth Revision (ICD-9) codes of 428, 428.1, 428.2, 428.21, 428.22, 428.23, 428.3, 428.32, 428.33, 428.4, 428.41, 428.42, 428.43, and 428.9 associated with HF were extracted. Project RED was implemented on July 1, 2014. All components of Project RED implemented by the hospital are included in the appendix. The chart review was conducted in 2 phases. Phase 1, called the pre–Project RED phase, consisted of data extracted 6 months before the implementation of Project RED from February 1, 2014 to July 31, 2014. Phase 2, called the post–Project RED phase, consisted of data extracted 4 months after the implementation of Project RED from August 1, 2014, to November 30, 2014.

The following patient information was extracted: age, social security number, gender, race, housing status post discharge, left ventricular ejection fraction, date of hospital admission, date of hospital discharge, length of hospital stay, type of hospital utilization (emergency department vs readmission), date of primary care appointment scheduled at the time of discharge, date of primary care appointment attended post discharge, and cost savings. The study was conducted in accordance with the ethical standards of the responsible committee on human experimentation and all investigators complied with the principles of the Belmont Report.

The study population for the pre–Project RED phase included no more than 100 adult veterans, aged 18 years and older, who were admitted for HF exacerbation between February 1, 2014, and July 31, 2014. The study population for the post–Project RED phase included no more than 50 adult veterans, aged 18 years and older, who were admitted for HF exacerbation between August 1, 2014, and November 30, 2014, and had received the education component of Project RED. Patients who did not have a documented education note post discharge in the post–Project RED phase were excluded from the study. All patients with an admission left ventricular ejection fraction of >55% were also excluded from the study. Patients, who received Project RED education versus those who did not, were compared in the study.

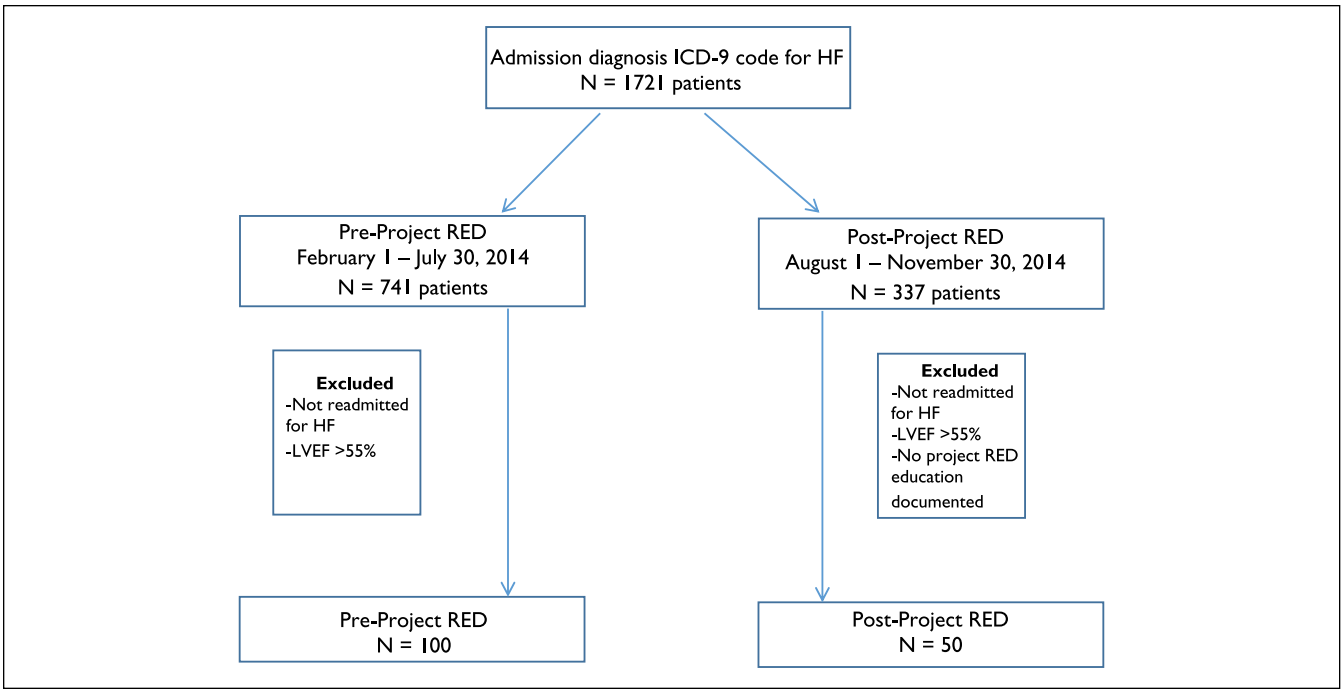

Figure 1. Enrollment.
Note. ICD-9 = International Classification of Diseases, Ninth Revision; HF = heart failure; RED = Re-Engineered Discharge; LVEF = left ventricular ejection fraction.

The primary outcome of this study was to assess the unplanned hospital utilization for HF exacerbation within 30 days post discharge in patients who received Project RED education versus those who did not. An unplanned hospital utilization was determined by utilizing 2 parameters: ICD-9 codes as well as discharge summary notes. To minimize bias from inappropriate coding errors, discharge summary notes were reviewed to ensure patient had an unplanned hospital readmission for HF exacerbation. The secondary outcomes included assessing the all-cause mortality, primary care appointment scheduled at discharge, attendance to a primary care appointment within the recommended time frame post discharge, and cost savings. Cost savings were calculated by obtaining the difference between the total readmission cost (hospital readmission cost + emergency room [ER] visit cost + PCP visit cost) between the 2 groups.

Baseline characteristics of race, gender, and housing status were compared between the pre–Project RED and post–Project RED phases using Pearson's chi-square test. All other baseline characteristics were compared using student's *t* test. Primary outcome assessing unplanned 30-days hospital utilization for HF exacerbation was compared using chi-square test. All secondary outcomes were assessed using Pearson's chi-square test except for cost savings for which independent student *t* test was used. *P* values less than .05 were considered statistically significant. All data outcomes collection and analysis were performed by primary author.

Results

A total of 1721 unique patient charts were extracted with the above mentioned ICD-9 codes for HF; 741 patient charts from February 1 to July 31, 2014, were reviewed to obtain the first 100 patients who met the predefined inclusion and exclusion criteria. For the post–Project RED phase, 337 patient charts from August 1 to November 30, 2014 were reviewed to obtain the first 50 patients who met the predefined inclusion and exclusion criteria (Figure 1).

The baseline characteristics of patients in study groups, pre–Project RED and post–Project RED phases, were similar (Table 1). Overall, the mean age was 70.6 years and 72.1 years for the pre–Project RED and post–Project RED groups, respectively. The majority of subjects were male and non-black. Left ventricular ejection fraction was 35% and 32.05% for the pre–Project RED and post–Project RED groups, respectively. The average length of hospital stay was similar between both groups.

There were 2 statistically significant differences noted between the 2 groups. There was a significant reduction in the all-cause mortality between the pre–Project RED and post–Project RED patients (41% vs 24%, respectively; $P = .04$). In addition, the post–Project RED group had a higher rate of PCP appointments attended by patients based on their postdischarge follow-up instructions (19% vs 40%, respectively; $P = .006$). There was a lower rate of 30-day hospital readmission for the patient group that received Project RED

Table 1. Baseline Characteristics.

Characteristics	Pre–Project RED (N = 100)	Post–Project RED (N = 50)	*P* value
Age, years (SD)[a]	70.6 ± 10.8	72.12 ± 8.88	.37
Gender, n (%)[b]			
Male	99 (99)	49 (98)	.62
Female	1 (1)	1 (2)	
Race, n (%)[b]			
Black	31 (31)	14 (28)	.71
Nonblack	69 (69)	36 (72)	
LVEF, %[a]	35	32.05	.71
Length of hospital stay[a]	5.61	5.85	.66

Note. RED = Re-Engineered Discharge; LVEF = left ventricular ejection fraction; SD = standard deviation.
[a]Statistical test: Independent Student *t* test.
[b]Statistical test: Pearson's chi-square test.

Table 2. Cost analysis.

Parameter	Pre–Project RED (N = 100)	Post–Project RED (N = 50)
Length of hospital stay	5.61	5.85
Hospital readmission cost per day, $	2937	2937
Hospital readmission cost per visit, $ (Hospital readmission cost per day × Length of hospital stay)	16 476.57	17 181.45
Hospital readmissions, %	28	18
Hospital readmission cost per 100 visits, $ (Hospital readmission cost per visit × % Hospital readmissions × 100)	461 343.96	309 266.10
PCP cost per visit. $	298	298
PCP follow-up visits, %	19	40
PCP cost per 100 visit, $ (PCP cost per visit × % PCP visits × 100)	5662	11 920
ER cost per visit, $	516	516
ER visits, %	1	2
ER cost per 100 visits, $ (ER cost per visit × % ER visits × 100)	516	1032
Total cost per 100 visits, $ (Total hospital cost + PCP visit cost + ER visit cost for 100 visits)	467 521.96	322 218.10
Cost savings per 100 patients, $ (Pre–Project RED cost – Post-Project RED cost)	145 303.86	
Cost savings/visit, $	1453	

Note. RED = Re-Engineered Discharge; PCP = primary care physician; ER = emergency room; CAVHS = Central Arkansas Veterans Healthcare System. Utilized CAVHS average cost of hospital visit broken down by treating specialty–Cardiology–information as provided by CAVHS Facility Revenue Manager.[10]

education intervention (post–Project RED phase) versus those who did not (pre–Project RED phase) (28% vs 18%, respectively; $P = .18$). The number of PCP appointments scheduled at the time of discharge between pre–Project RED and post–Project RED groups were slightly different (6% vs 2%, respectively; $P = .274$). With the decrease in 30 days' hospital readmission rate post–Project RED education intervention, there was a cost savings of $1453 per patient visit for HF exacerbation (Table 2).

Discussion

Overall, all baseline characteristics were very similar in both groups. The increase in percent of primary care appointments attended by patients, based on postdischarge instructions, reiterates that the Project RED intervention provides a better transition for patients post discharge and they are more likely to attend their primary care appointment. The study excluded patients with left ventricular ejection fraction >55% to avoid a potential bias to select healthier patients. All unplanned hospital readmissions for HF exacerbations were included (emergency department and readmission). A majority of the patients did not have a PCP appointment scheduled at discharge. This might be a reason for the lack of statistical significance in the 30-day hospital readmission rate for HF exacerbations post discharge in both groups, as the patients were not followed-up in a timely fashion post discharge.

This study has several limitations that should be noted. First, this was a retrospective review which lends itself to some biases. A majority of the patients included in the study were males, and hence, it reduces the external validity of the study. However, this patient population is very similar to other Veterans Affairs hospitals all over the United States. The data collection did not collect information on other comorbidities which could be a confounding variable for the results for computing all-cause mortality and 30-day hospital readmission rate. Also, it is important to note that prior to the official implementation of Project RED at the end of June 2014, staff members from interdisciplinary teams were educated on how to effectively implement Project RED discharge tool. There is a potential for noneffective Project RED implementation in the first 2 months post initiation, due to the learning curve involved with the implementation of a new clinical intervention. While patients were prescribed loop diuretics for symptom management, the study did not collect information on the number of diuretic doses patient took prior to hospitalization. Baseline weight information and home health information were also not collected for this patient population.

Based on the results found in this study, scheduling PCP appointments at the time of discharge would be recommended for future interventions. Project RED intervention was implemented for patients admitted with an HF exacerbation. However, based on the methods employed in this study, Project RED can be implemented for enhancing effective discharge of patients with other disease states such as chronic obstructive pulmonary disease exacerbation, pneumonia, and so on.

Based on the data collected in this study, it appears that post–Project RED patients had a lower rate of 30-day hospital readmission for HF, decreased all-cause mortality, increased follow-up with PCP appointments attended per postdischarge instructions, and higher cost saving. While primary outcome of 30-day readmission was not statistically significant, it may still be of clinical significance in practice.

Appendix

Project RED Team Checklist

Heart failure team. This checklist is available to let us know what education you have received. If any of the education is not completed during admission, please keep this form so that it may be done on an outpatient basis.

- CHF EDUCATION TEAM NOTE STARTED_____
- (CNL/or Team Coordinator):_____

Followed in:

- ○ _____Primary Care Clinic
  _____Has PCP contact information or
- ○ _____CHF Clinic
  _____Has CHF Clinic contact information or
- ○ _____Other
- ■ _____No PCP
- • _____6B Follow-up
- ■ _____Non-CAVHS VA physician
- • _____Provider contact information obtained
- • Notified PCP that patient was admitted with CHF Exacerbation

- • Scales at home (Team Coordinator)_____
- ○ _____yes
- ○ _____no
- ■ _____prosthetics c/s placed
- ■ _____scales delivered to patient
- ■ _____patient weighed on home scales prior to d/c
- ■ _____patient physically unable to weigh himself/herself

- • Dietician_____
- ○ _____Patient education completed
- ○ _____Shopper/Meal Preparer education completed
- ○ _____Teach back

- • Patient education (Nurse)
- ○ _____What is heart failure
- ○ _____What causes heart failure
- ○ _____**Signs and symptoms of heart failure******
- ○ _____How heart failure is diagnosed
- ○ _____What can you do
- ○ _____**Daily weights******
- ○ _____**What can you eat and drink******
- ○ _____**Fluid Intake******
- ○ _____Activity and exercise goals
- ○ _____Sexual activity
- ○ _____**Medications/Medication tips:******
- ○ _____Maintaining a healthy lifestyle
- ○ _____TIGER video
- ○ _____Teach back

- • Pharmacist education
- ○ _____Discharge medication list
- ○ _____Medication tips
- ○ _____Symptom action plan, if appropriate (Pharmacist)
- ○ _____Teach back

- • Nurse) _____ Symptom action plan, if appropriate, reviewed at discharge

- • Nurse) Plan for discharge follow-up reviewed at discharge _____ (recommended w/.in 1 week of d/c) _____ appointment scheduled at time of d/c_____ scheduled appt. w/in 1 week of d/c_____

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Declaration of Conflicting Interests

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