HEALTH CARE REFORM

Effectiveness and Cost of a Transitional Care Program for Heart Failure

A Prospective Study With Concurrent Controls

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Background: Randomized controlled trials have demonstrated the efficacy of nurse-led transitional care programs to reduce readmission rates for patients with heart failure; the effectiveness of these programs in real-world health care systems is less well understood.

Methods: We performed a prospective study with concurrent controls to test an advanced practice nurse–led transitional care program for patients with heart failure who were 65 years or older and were discharged from Baylor Medical Center Garland (BMCG) from August 24, 2009, through April 30, 2010. We compared the effect of the program on 30-day (from discharge) all-cause readmission rate, length of stay, and 60-day (from admission) direct cost for BMCG with that of other hospitals within the Baylor Health Care System. We also performed a budget impact analysis using costs and reimbursement experience from the intervention.

Results: The intervention significantly reduced adjusted 30-day readmission rates to BMCG by 48% during the postintervention period, which was better than the secular reductions seen at all other facilities in the system. The intervention had little effect on length of stay or total 60-day direct costs for BMCG. Under the current payment system, the intervention reduced the hospital financial contribution margin on average $227 for each Medicare patient with heart failure.

Conclusions: Preliminary results suggest that transitional care programs reduce 30-day readmission rates for patients with heart failure. This underscores the potential of the intervention to be effective in a real-world setting, but payment reform may be required for the intervention to be financially sustainable by hospitals.

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HEART FAILURE (HF) IS A chronic health condition characterized by high mortality and frequent costly hospitalizations.[1-3] Approximately 14% of the Medicare population has HF, and the illness is the most common reason for hospitalization in patients 65 years or older.[2,4] Previous studies have demonstrated rates of readmission for HF from 10% to 19% at 2 weeks[5] to as high as 50% within 3 months.[6] In addition, almost one-fifth of the Medicare beneficiaries who are discharged from the hospital are rehospitalized within 30 days, and 34% are rehospitalized within 90 days. Partly because of frequent readmissions, the national Medicare hospital bill for HF was $33 billion in 2006; this represents 7.4% of the total annual Medicare hospital bill.[7] Unplanned rehospitalizations cost Medicare $17.4 billion in 2004, and Medicare outlays for potentially preventable readmissions may be as much as $12 billion per year.[2]

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Despite its high prevalence, HF care is often fragmented and uncoordinated.[8,9] A growing body of evidence demonstrates the benefits of multidisciplinary care in HF.[10,11] Multidisciplinary teams and in-person communication at the patient's home are factors that predict program success.[12-15] A Centers for Medicare and Medicaid (CMS)–funded study of 15 care coordination programs found that 2 programs were successful, and they shared the following 2 crucial features: (1) care coordinators interacted in person with patients and did not simply educate or assist them by telephone and (2) care coordinators collaborated closely with patients' physicians to influence care.[16,17] Because the transition of Medicare beneficiaries with HF from hospital to home is associated with a high risk of hos-

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pital readmission, care coordination programs with these 2 crucial features are most likely to be successful.

Transitional care programs (TCPs) that include predischarge interventions and postdischarge house calls by an advanced practice nurse (APN) have been demonstrated to reduce readmission rates for HF.[18-20] Advanced practice nurses contribute to the success of these programs by educating patients and their family about the meaning of their symptoms and appropriate self-management strategies, improving patient–health care provider communication patterns, and marshaling caregiver and community resources to maximize patient adherence to the treatment plan and improve overall quality of life.[21] In 2004, Naylor et al[20] published the results of a randomized controlled trial that demonstrated the efficacy of a TCP delivered by APNs to decrease hospitalizations for elderly patients with HF. The intervention increased the time between hospital discharge and readmission or death, reduced the total number of rehospitalizations, and decreased health care costs.

Although the TCP described by Naylor et al[20] has been shown to have high efficacy in a controlled setting, the effectiveness of similar programs in real-world health care systems has been less extensively researched. The dearth of published research on quality improvement initiatives such as TCPs unfortunately limits clinical knowledge about their effectiveness.[22] Despite the strength of the evidence generated by the design of the randomized controlled trial, efficacy-based research designs are not always the most appropriate for testing quality improvement initiatives.[23] Transitional care interventions and other quality improvement programs have complex effects when instituted in the context of the day-to-day operations of a hospital and need to be studied in and tailored to representative settings.[24,25] In fact, the characteristics that make an intervention efficacious (eg, the level of intensity of the intervention and whether it is designed for motivated, homogeneous populations) may mitigate its effectiveness in more complex, less advantageous settings with less motivated patients and more overworked staff.[23,26] In addition, health care organizations must find resources to implement these programs, which often call for a significant commitment to care coordination across settings.[27,28] Programs must be financially sustainable in real-world settings for facilities to commit resources for start-up costs and continuously fund these programs.

The objective of this study was to assess the effectiveness of an APN-led TCP for recently hospitalized patients with HF at a single hospital in a multihospital health care system and to determine the impact of this TCP on the 30-day (from discharge) all-cause readmission rate, length of stay (LOS), and 60-day (from admission) direct cost. A secondary objective was to perform a budget impact analysis for the intervention using costs and reimbursement experience from the intervention.

METHODS

SETTING

This pilot study was conducted at Baylor Medical Center Garland (BMCG) within the Baylor Health Care System (BHCS). Located in the Dallas–Fort Worth metroplex in North Texas, the BHCS includes 10 acute care hospitals, 21 ambulatory surgical centers, 7 short-stay surgical hospitals, 136 HealthTexas Provider Network locations employing 450 physicians, 41 satellite outpatient clinics, 4 senior health care centers, more than 19 000 employees, and the Baylor Research Institute. There are approximately 2500 HF admissions across the BHCS each year.

The BMCG is a 263-bed medical center serving the residents of Garland, Texas, and the neighboring communities of Wylie, Richardson, Rowlett, Rockwall, Sachse, Mesquite, and Murphy. Annually, BMCG has more than 12 000 admissions, 55 000 emergency department visits, and 75 000 outpatient visits; approximately 300 admissions per year are for HF.

POPULATION

The study population included all patients 65 years or older discharged from BMCG from August 2009 through April 2010 with a principal diagnosis of HF. Analysis was restricted to those patients predicted to be eligible for the CMS Heart Failure Readmission Measure.[29]

SCREENING AND ENROLLMENT

Patients were screened for eligibility within 48 hours of hospital admission to BMCG. Screening included daily census reports, a prescription list of intravenous diuretics, B-type natriuretic peptide levels of greater than 200 ng/mL on admission, and eligibility for Joint Commission HF core measures. Because the program was offered as a quality improvement service, written informed consent was not required; patients could decline enrollment or opt out of further participation at any time. Patients not enrolled in the study received routine care, including care management assistance with discharge planning and referral for home health care services if appropriate.

INTERVENTION

The enrollment window for the intervention was August 24, 2009, through April 30, 2010. The intervention was a 3-month program involving transitional care provided by an APN. The initial APN home visit occurred within 72 hours of the index hospital admission and included defining patients' and caregivers' goals; exploring the nature, duration, and severity of HF and comorbid conditions; reviewing general health behaviors and skills; and identifying the availability of social support. At least 8 APN home visits were conducted for each patient. The APN was available by telephone 7 days a week. The APN performed protocol management, goal setting, and patient and family education. If a patient was rehospitalized during the intervention period, the APN resumed hospital visits to facilitate the transition to home at discharge from the readmission. Patients were released from the program at any time by patient request, on admission to a nursing home or skilled nursing facility, at the end of 3 months from initial enrollment, or on death.

DATA

Data were collected via BHCS administrative data sets. Any hospitalization for HF at BMCG during the study period was considered an index admission. Hospitalization for any cause within 30 days from the date of discharge for the index admission to any acute care general medical/surgical hospital within BHCS was considered a readmission. Patient age, sex, race, ethnicity, all-patient refined–diagnosis related group severity of illness (for resource utilization) and risk of mortality, index admission LOS, index admission crude readmission rate, index admission–adjusted readmission rate, and financial outcomes

Table 1. Descriptive Summary Statistics of Heart Failure Patient Characteristics at BMCG and Other BHCS Hospitals[a]

Variable	BMCG (n = 140)	BHCS (n = 885)	*P* Value[b]
Demographics			
Age, mean (SD), y	80.4 (8.4)	79.1 (8.3)	.17[c]
Male sex	62 (44.3)	423 (47.8)	.80[d]
White race	109 (77.9)	743 (84.0)	.95[d]
Hispanic ethnicity	7 (5.0)	55 (6.2)	.61[d]
APR-DRG severity of illness			
1	4 (3.0)	28 (3.2)	.68[d]
2	50 (35.7)	271 (30.6)	
3	70 (50.0)	471 (53.2)	
4	16 (11.4)	115 (13.0)	
APR-DRG risk of mortality			
1	4 (2.9)	27 (3.1)	.89[d]
2	55 (39.3)	349 (39.4)	
3	58 (41.4)	343 (38.8)	
4	23 (16.4)	166 (18.8)	

Abbreviations: APR-DRG, all-patient refined–diagnosis related group; BHCS, Baylor Health Care System; BMCB, Baylor Medical Center Garland.
[a] Includes patients discharged from August 24, 2009, through April 30, 2010. Unless otherwise indicated, data are expressed as number (percentage) of patients. Percentages have been rounded and may not total 100.
[b] Indicates comparison between heart failure patients at BMCG and BHCS.
[c] By 2-tailed unpaired *t* test.
[d] By χ^2 test.

Table 2. Comparison of TCP vs Nonintervention Patients at Baylor Medical Center Garland[a]

Variable	TCP Patients (n = 56)	Nonintervention Patients (n = 84)	*P* Value[b]
Demographics			
Age, mean (SD), y	78.9 (8.3)	81.4 (8.3)	.09[c]
Male sex	24 (42.9)	38 (45.2)	.78[d]
White race	39 (69.6)	70 (83.3)	.06[d]
Hispanic ethnicity	4 (7.1)	3 (3.6)	.44[e]
APR-DRG severity of illness			
1	3 (5.4)	1 (1.2)	.08[e]
2	25 (44.6)	26 (31.0)	
3	21 (37.5)	48 (57.1)	
4	7 (12.5)	9 (10.7)	
APR-DRG risk of mortality			
1	1 (1.8)	3 (3.6)	.10[e]
2	29 (51.8)	26 (31.0)	
3	19 (33.9)	39 (46.4)	
4	7 (12.5)	16 (19.0)	

Abbreviations: APR-DRG, all-patient refined diagnosis related group; TCP, transitional care program.
[a] Indicates patients discharged from August 24, 2009, through April 30, 2010. Unless otherwise indicated, data are expressed as number (percentage) of patients. Percentages have been rounded and may not total 100.
[b] Indicates comparison between the TCP vs nonintervention group.
[c] By 2-tailed unpaired *t* test.
[d] By χ^2 test.
[e] By Fisher exact test.

(direct costs for patient care and contribution margin based on reimbursements) were collected from the same source.

STATISTICAL ANALYSIS

Our first objective was to determine the impact of the intervention on performance of BMCG with regard to HF readmission rates, LOS, and total 60-day direct costs compared with other facilities in BHCS. For the preintervention period, all HF patients predicted to be eligible for the Medicare HF measure on the basis of inclusion and exclusion criteria provided by CMS and represented in the BHCS administrative data were included from all facilities.[29] For the postintervention period, all eligible patients (regardless of participation in the pilot) at BMCG were compared with all eligible HF patients for the other facilities within BHCS. A log-gamma model was used to model direct cost owing to the highly skewed nature of the distribution. Adjustment was made using age, sex, race, and all-patient refined–diagnosis related group severity. The method of recycled predictions[30] was used to estimate the effect of the intervention on predicted costs, LOS, and readmission rate using the different models considered, with bootstrapping used to obtain 95% confidence intervals. All analyses were conducted using commercially available software (SAS version 9.2; SAS Institute, Inc, Cary, North Carolina).

For the second objective, a budget impact analysis was performed to explore net inpatient costs and intervention costs from the budget holder perspective, in this case the hospital.[31] Deterministic calculations were based on average costs and reimbursements derived from experience with the intervention during the study.

RESULTS

From August 24, 2009, through April 30, 2010, 140 Medicare HF patients were eligible for the intervention; of these, we enrolled 56 (40.0%). **Table 1** provides descriptive summary statistics of HF patient characteristics at BMCG and BHCS discharged during the study period; **Table 2** gives descriptive summary statistics of HF patients in the intervention and nonintervention groups. The results demonstrate no significant difference between HF patients at BMCG compared with BHCS or between HF patients enrolled or not enrolled in the intervention for the postintervention period. **Table 3** displays differences in the preintervention and postintervention mean index LOS, mean total 60-day direct cost, and facility 30-day readmission rate for BHCS and BMCG. There was little difference for LOS between BMCG and BHCS during the control period, and the intervention did not have a significant effect. Before the intervention, total 60-day direct cost for an HF index admission at BMCG was $1251 less on average than the system average for BHCS. Although postintervention costs were less at BMCG, the difference between BMCG and the system narrowed during the intervention period owing to a significant reduction in total 60-day direct costs for BHCS facilities (excluding BMCG). There were no deaths in the intervention group 30 days after discharge and, of all the BMCG HF patients admitted during the study period, only 2 died within 30 days of discharge (data not shown).

Adjusted 30-day readmission rate was 48% lower at BMCG after the intervention than before the intervention. The statistically significant improvement in readmission rates was not observed for the rest of BHCS between the control and postintervention periods. The differential impact of the intervention for BMCG compared with BHCS before and after the intervention is displayed in the **Figure**.

Table 3. Adjusted Readmission Rate and Mean for LOS and Direct Cost at BMCG and Other BHCS Acute Care Hospitals Before and After TCP[a]

Outcome	Adjusted Value (95% CI)		Difference	Change, %
	Before TCP	After TCP		
LOS for index admission, mean, d				
BMCG	5.2 (4.7 to 5.6)	5.1 (4.6 to 5.6)	0.0 (–0.7 to 0.6)	–2.0 (–12.8 to 11.8)
Not enrolled		5.1 (4.4 to 5.8)	–0.1 (–1.1 to 0.9)	–2.0 (–20.1 to 19.8)
Enrolled		5.0 (4.3 to 5.7)		
BHCS	5.5 (5.2 to 5.7)	5.3 (5.1 to 5.6)	–0.1 (–0.5 to 0.2)	–4.0 (–8.2 to 3.3)
Total 60-d direct cost, mean, $				
BMCG	5729 (5076 to 6383)	5176 (4585 to 5768)	–553 (–1406 to 300)	–10.0 (–23.5 to 4.7)
Not enrolled		5200 (4287 to 6113)	–570 (–1688 to 549)	–11.0 (–29.6 to 13.4)
Enrolled		4630 (3674 to 5586)		
BHCS	6980 (6593 to 7367)	6107 (5706 to 6509)	–873 (–1348 to –398)	–13.0 (–18.9 to –6.0)
Readmission within 30 d				
BMCG	25.2 (19.4 to 31.0)	12.6 (7.4 to 17.8)	–12.6 (–20.5 to –4.7)	–48.0 (–73.7 to –24.7)
Not enrolled		14.1 (6.8 to 21.4)	–6.0 (–16.1 to 4.1)	–42.9 (–86.0 to 52.3)
Enrolled		8.1 (1.5 to 14.8)		
BHCS	18.0 (15.8 to 20.1)	16.4 (14.0 to 18.7)	–1.6 (–4.7 to 1.6)	–11.0 (–25.3 to 8.5)

Abbreviations: BHCS, Baylor Health Care System; BMCG, Baylor Medical Center Garland; CI, confidence interval; LOS, length of stay; TCP, transitional care program.

[a]Before TCP indicates July 1, 2008, through August 23, 2009; after TCP, August 24, 2009, through April 30, 2010.

Table 4 shows the impact of the intervention on per-patient direct costs, revenue (from reimbursements), and contribution margin (the difference between reimbursements and direct costs). Total direct costs for patients receiving the intervention were less than those receiving usual care. However, costs associated with the intervention were not recovered through reductions in index admission direct inpatient costs—the intervention did not save money from the hospital perspective. Additionally, under the current reinbursement system, the hospital lost revenue by preventing readmissions and had a reduction in the contribution margin for an episode of care.

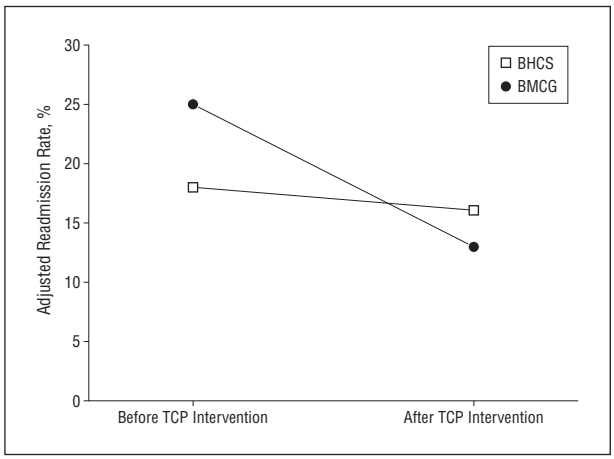

Figure. Adjusted 30-day (from discharge) all-cause readmission rate. Rates are for patients 65 years or older discharged with heart failure from other Baylor Health Care System (BHCS) acute care hospitals and Baylor Medical Center Garland (BMCG) before (July 1, 2008, through August 23, 2009) and after (August 24, 2009, through April 30, 2010) the transitional care program (TCP).

COMMENT

We found that the impact of the APN-led TCP for HF patients on LOS and 60-day direct costs was minimal, but the TCP significantly reduced readmission rates 30 days after discharge for patients with HF. Our findings extend those from a randomized controlled trial to a real-world setting.[20] The impact was observed despite only 40.0% of the population being enrolled in the intervention. Although Hawthorne effects at BMCG may have contributed to beneficial changes in care even for patients not enrolled in the study, the interference would not undermine the impact of the intervention in an effectiveness study and the findings remain persuasive. These results build on our positive experience with wide deployment of an HF order set across BHCS before the initiation of this transitional care intervention.[32] Further gains might be possible if the intervention could be tailored to enroll more HF patients during their index admission or otherwise increase the participation rate.

Although the intervention reduced readmissions, the results of the budgetary impact assessment suggest that it has a negative effect on contribution margin in the current environment. Readmissions are fully reimbursed under the current payment system, and no specific revenue stream exists for many of the additional expenses associated with the intervention, resulting in a reduction of reimbursements per episode of care. The combination of intervention effects on direct costs and reimbursements results in a reduction in the contribution margin per patient. Estimated reduction in reimbursements for HF readmissions by CMS that will take effect during the next 3 years reduces the negative impact of the intervention on contribution margins by only 10%. A bundled payment system, based on a 30-day postdischarge episode of care in which no additional payments would be made for readmission, makes the intervention financially more attractive than usual care. However, the modified reimbursement system would result in a significant reduction in contribution margin if

Table 4. Providers' Perspective Budgetary Impact Analysis[a]

	Index Admission Direct Inpatient Costs	Intervention Costs	Total Costs	Episode of Care Costs[b]	Revenue per Episode of Care[c]	Contribution Margin	Difference in Contribution Margin[d]
Current payment system, $							
Status quo	5480	0	**5480**	6760	8196	1436	
Intervention	4550	1110	**5660**	6236	7445	1209	(227)
Partial payment system, $							
Status quo	5480	0	**5480**	6760	8155	1395	
Intervention	4550	1110	**5660**	6236	7426	1190	(205)
Bundled payment system, $							
Status quo	5480	0	**5480**	6760	6830	70	
Intervention	4550	1110	**5660**	6236	6830	594	524

[a] All values represent average per patient.
[b] Estimate based on 100 patients for cost of index admission plus in-hospital care 30 days after discharge.
[c] Estimated revenue for inpatient services index admission to 30 days after discharge, inclusive.
[d] Parentheses represent a loss of contribution compared with the status quo.

payment rates are set at the current level for HF index admissions under Medicare's prospective payment policy, without additional consideration for the cost of interventions such as TCPs.

Hospitals, often mission-driven institutions philosophically predisposed to addressing local health problems, including those associated with transitions, must still be able to cover their costs and maintain adequate margins to remain solvent. The reductions in reimbursement for readmissions proposed by CMS would begin to minimize the negative effect on contribution margins of interventions reducing readmissions but probably do not go far enough to sustain these interventions in the long term.[33] Policy consultants[34-36] have recently proposed a framework in which Medicare would offer an array of new bundled payment options for physician group practices, hospitals, and health care delivery systems, with incentives to encourage greater integration into the organization of health care delivery and the provision of more coordinated patient care and improved transitional care. Under these potential future payment systems, such as episodic or bundled payment systems, all readmissions would represent costs. Maximizing revenue might require hospitals to use an array of interventions to minimize rehospitalizations. Patients at low risk for readmission might benefit from a more limited intervention such as telephonic support, and others at the highest risk might require more complete models of care such as hospital-at-home programs to address these changes.[37] If reimbursed with bundled payments, hospitals that successfully reduced fragmentation and bridged the transition to keep patients healthy and out of the hospital would not only benefit their patients but also their bottom line. Regardless of the exact interventions hospitals chose to use, the budget impact analysis suggests that the bundled payment for the index admission would need to be higher than current rates to adequately fund these additional programs.

The study is a before-and-after intervention study with concurrent controls. Limitations of this study include all the limitations inherent to observational studies, including potentially unobserved differences in the study population at BMCG compared with the various hospitals within the BHCS. Although adjustment was made for available characteristics, there remains the possibility that unmeasured differences could affect the outcomes of LOS, costs, and readmission. Additional limitations of this study involved screening, reach, and event capture. With regard to screening, timely identification of all potential candidates hospitalized with HF presents a challenge requiring a significant investment of time and resources. Regarding the reach of the program, approximately 25% of Medicare patients hospitalized with HF are discharged to skilled nursing facilities/nursing homes and are not reached by the intervention. Addressing their transitional care needs requires modification of the intervention or development of a separate targeted intervention. In terms of event capture, data access is limited by Health Insurance Portability and Accountability Act regulations preventing the identification of readmission events at facilities outside the BHCS.

More widespread use of electronic health records is expected to improve the effectiveness of screening to identify patients with HF who might benefit from a transitional care intervention. In addition, an electronic health record can potentially provide real-time risk stratification to focus the intervention on those most in need of additional support.[38] This may in turn lower the cost of interventions to reduce readmissions by not requiring an individual to be a conduit of information to the different providers. The effectiveness of the APN-led TCP provides further evidence that hospitals have the tools to reduce readmissions for HF patients, but payment policy must be amended to align incentives for hospitals to produce the highest value by reducing problems during transitions in care.

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