

The Financial Impact of Team-Based Care on Primary Care

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Minimizing levels of risk factors for individuals who have coronary heart disease (CHD) could prevent or postpone 71% of deaths among Americans with heart disease who are aged 30 to 84 years,¹ and a team-based approach has been shown to improve control of blood pressure and serum cholesterol levels.^{2,3} Although the Community Preventive Services Task Force has concluded that a team-based approach to blood pressure control is cost-effective, they have also concluded that it generates a net cost.⁴

We hypothesized that, because patients with CHD are at a much higher risk of another cardiac event in the near term, it might be possible to implement a team-based care system that would be revenue-neutral or revenue-positive for primary care. In this report, we describe the results of our attempt to design and implement such a system in partnership with a private practice that comprised 5 clinic sites.

METHODS

The HealthPartners Institute Institutional Review Board approved the study as protocol #09-132.

The 5 clinic sites that participated in the trial were located 30 to 50 miles from a large Midwestern urban center and cared both for patients who worked for large companies in the metropolitan area and patients who were self-employed in farming or worked in light manufacturing in small towns. Nearly all of the patients served by these clinics identify as non-Hispanic white and have some sort of insurance.

We based our intervention on the principles of complex adaptive systems and diffusion of innovation⁵⁻⁸ and were able to improve low-density lipoprotein cholesterol (LDL-C) control and increase the rate at which taking aspirin was documented in the medical record.⁹ We also documented the activities that the clinics undertook to implement and maintain their care systems.¹⁰

Intervention

Our only firm requests to the participating clinics were that they use the grant resources to improve their Minnesota Health Scores

ABSTRACT

OBJECTIVES: Although team-based care can improve coronary heart disease (CHD) risk factors and is considered cost-effective from a healthcare system perspective, little is known about the financial impact of team-based primary care for secondary prevention of CHD. The purpose of this study was to define the impact of team-based care for CHD on utilization, costs, and revenue of a private primary care practice.

STUDY DESIGN: Interrupted time series analysis.

METHODS: Between March 1, 2010, and March 31, 2013, we assisted a private medical practice, comprising 5 primary care clinic sites, to organize and deliver team-based care for patients with CHD. We used billing records and the registered nurse care manager's diary to calculate the cost of team-based care, differences in the average number of visits per patient, and revenue per patient before and after the implementation of team-based care.

RESULTS: The net cost of team-based primary care was \$291 per patient over the 1-year period of observation.

CONCLUSIONS: The findings from this study are consistent with other economic analyses of team-based care and suggest that payment for care must be restructured if patients are expected to enjoy the benefits of team-based primary care.

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TAKE-AWAY POINTS

- ▶ The Community Preventive Services Task Force has concluded that although it generates costs, team-based care is both effective and cost-effective in controlling coronary heart disease (CHD) risk factors.
- ▶ We also found that team-based care has a negative financial impact on primary care under a fee-for-service payment system.
- ▶ However, team-based care for patients with CHD has the potential to be cost-saving for accountable care organizations if team-based care reduces overall costs by as little as 2%.

vascular disease quality scores and hire a registered nurse (RN) care manager to coordinate their team-based care program. Although the National Institutes of Health grant paid her salary, the RN care manager was a clinic employee who reported to one of the clinical services managers and a lead primary care physician; she did not report to the investigators. The clinics were otherwise free to use existing care processes or develop new ones as they chose. The design of the team-based care system and the tasks undertaken by the staff are described more fully in previous publications.^{9,10}

Evaluation

We identified 663 patients who were treated for CHD—but may also have had diabetes—from March 1, 2009, to February 28, 2010; this was the pre-intervention (baseline) period during which there was no assistance. We also identified a reference population of 1643 patients without CHD who were treated for diabetes during the same period. We collected baseline data from randomly selected samples of these 2 groups of patients ($n = 551$ for the sample with CHD and $n = 485$ for the sample with diabetes). The implementation period was 18 months in each clinic site. During the postimplementation evaluation period of December 1, 2011, to March 31, 2013, the clinics treated 1012 patients for CHD and treated 1828 patients without CHD for diabetes. We collected postimplementation data on independently identified random samples of these patients ($n = 529$ for patients with CHD and $n = 509$ for patients with diabetes). The postimplementation period was longer than 1 year because implementation was staggered in the 5 clinic sites.

To capture the tasks that she addressed, the RN care manager kept a diary of her activities on randomly selected days of each month during the intervention. She recorded both the type of activity and with whom, if anyone, she was meeting.

We calculated the costs of team-based care by applying an estimate of employee compensation to employee hours. We estimated employee hours from study time logs, and we estimated employee salaries from national median hourly earnings, reported in Occupational Employment Statistics by the US Bureau of Labor Statistics for occupational codes 11-1000, 11-3030, 11-3120, 13-000, 13-2000, and 29-1141 for administration; codes 11-3021 and 15-1120 for information technology; and 29-1141 and 29-9090 for patient care.¹¹ We used average benefits rates from the National

Compensation Survey calculator to estimate the benefit rate associated with the paid wages.¹² We excluded from our estimates all time spent on research evaluation activities and initial planning and implementation.

We calculated revenue to primary care during the postimplementation period using billing data for the 534 patients in the sample for whom they were available; data were not available for 17 patients. Revenue

included total payments received by the medical group from both insurance plans and patients, but excluded unpaid bills. To better understand the source of revenue change, we also estimated average revenue per visit, average revenue per procedure, the number of office visits for any reason, the number of visits with a care provider associated with an evaluation and management (E&M) code, the average number of total procedures, and the average number of laboratory tests per patient.

We used a generalized linear model with a gamma distribution with a log-link function to estimate revenue measures and a negative binomial distribution and a log-link function for count data. We estimated the statistical model on the full data set of pre- and postintervention observations for both the 2 samples of patients with CHD and the 2 reference samples of patients with diabetes using a difference-in-difference variable specification. We applied the results to the pre-intervention CHD sample in order to predict what their costs would be in the postintervention period. Doing so allowed us to control for certain population characteristics (age, sex, insurance status) while comparing paid amounts pre- and post intervention.

RESULTS

Sample Characteristics

The pre-implementation CHD random sample comprised 635 patients and the postimplementation sample comprised 534 patients (Table 1). Fewer than 5% of patients were insured by Medicaid or lacked insurance altogether. Although we do not have data on supplemental insurance for patients who were insured by Medicare, national surveys suggest that about 90% would have had supplemental insurance.¹³ The demographic characteristics of the diabetes samples used to statistically model the financial impact of the team-based care program are presented in eAppendix Table A (eAppendices are available at www.ajmc.com).

Resources Used for Team-Based Care

During the 1-year intervention period, the staff spent 6856 hours providing team-based care to patients with CHD; 91% of these hours were devoted to direct patient care activities (Table 2). Applied to the 1012 patients treated for CHD, the cost is \$291 per patient.

TABLE 1. The Coronary Heart Disease Patient Populations on Which the Analysis Is Based

	Period	
	Pre-Implementation	Post Implementation
Patients treated for coronary heart disease	663	1012
Randomly selected sample for analysis, n	635	534
Male, %	75.0	73.0
Mean age, years	63.9	62.4
Age groups, %		
40-49 years	4.9	6.9
50-59 years	22.8	25.1
60-69 years	45.3	50.0
≥70 years	27.1	18.0
Insurance status, %		
Private	48.3	47.6
Medicare	49.3	48.5
Medicaid	1.6	1.3
No insurance	0.8	2.8

TABLE 2. Nonreimbursed Expenditures for Team-Based Care During the 12-Month Intervention Period

	Total Hours	Salary and Benefits, \$ ^a	Salary and Benefits Plus Facilities and Support Costs, \$ ^b
Administration	362	19,539	23,643
Information technology	232	17,373	21,021
Patient care by RN care manager and care coordinators	6262	206,359	249,694
Total	6856	243,271	294,358 (\$291 per patient ^c)

RN indicates registered nurse.

^aEstimated from national median hourly earnings reported in Occupational Employment Statistics by the US Bureau of Labor Statistics (BLS) for occupational codes 11-1000, 11-3030, 11-3120, 13-000, 13-2000, and 29-1141 for administration; codes 11-3021 and 15-1120 for information technology; and 29-1141 and 29-9090 for patient care.¹² We obtained national average benefits rates as a ratio of benefits to salary from the National Compensation Survey—Benefits, also from the BLS.¹³

^bFacilities and support costs are calculated at 21% of salary and benefits.

^cCost per patient is based on the total number of patients treated for coronary heart disease during the postimplementation period (n = 1012).

When her time allocation was defined by activity, the RN care manager spent 25% of her time updating the registry; 25% charting; and 18% attending, preparing for, and traveling to planning and patient care meetings (eAppendix Table B). The other activities that required her attention—discussing patient care, placing orders, requesting records, reviewing charts, and activities otherwise undefined—each consumed less than 10% of her time.

When defined by interaction, the RN spent 38% of her time in activities conducted alone; further, she spent an approximately equal proportion of time with care coordinators (17%) and patients (16%), and she spent 12% of her time with healthcare providers (physicians and other licensed providers), as well as 3% of her time with clinic

support staff. She spent 14% of her time with individuals not otherwise described.

Postimplementation Revenue Changes

Pre-implementation, the average number of total visits per patient was 9.2, the average number of visits with a provider (ie, a visit associated with an E&M code) was 4.4, and the average revenue per patient was \$878 (eAppendix Table C). Post implementation, the average number of total visits declined 5% to 8.7, the average number of visits with a provider declined 8% to 4.0, and the average revenue per patient declined 11% to \$779. In addition, the average revenue per office visit declined 4%, from \$109 to \$104; the average number of procedures declined 6%, from 21.8 to 20.6; the average revenue per procedure declined 3%, from \$44 to \$43; and the average number of laboratory tests per patient declined 17%, from 9.7 to 8.1.

Based on statistical modeling with comparison to patients with diabetes, team-based care for patients with CHD would be expected to produce a 5.7% increase in revenue per total visits and a 1.4% increase in revenue per procedure. However, team-based care would also be expected to produce a decline in total visits (−4.3%), visits with a provider (−1.4%), total procedures (−2.8%), and laboratory tests (−5.6%). The net result would be a 2.5% decline in revenue per patient (eAppendix Table D).

DISCUSSION

In this trial of team-based primary care in 5 clinic sites, we were able to demonstrate an improvement in LDL-C control and an increase in the rate at which aspirin use was documented.⁹ However, we were unable to create a system that would be revenue-neutral or revenue-positive for the primary care practice that is providing the service. Using a pair of diabetes patient samples as a comparator, statistical modeling indicated that although the revenue per visit increased (5.7%), the net effect of the team-based care system was to reduce the revenues earned per patient (−2.5%) because the number of visits was reduced (−4.3%).

The annual cost of \$291 per patient is very close to the median of 20 studies of team-based care for hypertension control considered by the Community Guide (median intervention cost per

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patient per year [PPPY], \$284; interquartile interval [IQI], \$153-\$670)⁴ and a randomized trial to improve care for patients with hypertension, diabetes, or heart failure by adding laypersons to the care team (\$286 PPPY).¹⁴

Based on the 20 studies it analyzed, the Community Guide estimated that team-based care for hypertension generates an additional \$65 (IQI, -\$235 to \$318) PPPY for outpatient and inpatient care, emergency department visits, and medications.⁴ If we assume that this same cost applies to the patients in our study, the annual total cost of team-based care (intervention costs + health-care costs) for patients in this study would be \$356 (\$291 + \$65).

However, patients who have CHD have a near-term risk of an event that is much higher than the risk for patients who have hypertension alone. This offers a number of near-term cost-reduction opportunities that are not available when caring for patients with hypertension. Total annual healthcare costs for patients with CHD have been reported to be \$18,953 in 2008 dollars¹⁵—\$6000 greater than the costs for patients who simply have hypertension.¹⁶ The cost of implementing team-based care that we computed earlier, \$356 PPPY, is 1.9% of this total cost. It is indeed possible that team-based primary care could reduce costs for an accountable care organization to this extent by reducing acute and emergent events and low-value and no-value care.¹⁷ These savings could then be shared with primary care providers; however, until savings are shared, the additional cost of team-based care will be a barrier to the adoption of the strategy by primary care practices.

Limitations

Our study has a number of important limitations. Some might consider a design that compared the intervention clinics with a set of parallel reference clinics to be a stronger design, but we were concerned that with such a design, unrecognized differences between patients in the intervention and control clinics might confound the results. Another weakness is the fact that the study was conducted in a single primary care practice with only 5 clinic sites and, because the team-based care model implemented to manage patients with CHD was new to the practice, it is possible that costs might decline as efficiencies developed over time. The trial is also limited by the short time horizon.

CONCLUSIONS

The average annual cost of implementing team-based care in our trial for a patient with CHD could be recovered by an accountable care organization if team-based care reduced the total cost of treating a patient who has CHD by as little as 2%. In the current payment system, however, all of the costs, and none of the sav-

ings from team-based care, are borne by primary care. This suggests that primary care practices will not adopt team-based care and their patients will not experience the benefits until new payment models are developed and implemented.

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eAppendix

Table A. Demographic Characteristics of the Comparison Cohort of Patients With Diabetes Used to Statistically Model the Financial Impact of Team-Based Care for Secondary Prevention of Coronary Heart Disease

	Period	
	Pre-Implementation	Post Implementation
Patients treated for diabetes	1643	1828
Randomly selected sample for analysis, n	559	515
Male, %	52.8	51.5
Mean age, years	60.2	58.8
Age groups, %		
40-49 years	13.6	17.1
50-59 years	32.6	33.6
60-69 years	36.7	37.5
≥70 years	17.2	11.8
Insurance status, %		
Private	59.7	58.6
Medicare	36.1	36.1
Medicaid	2.7	2.9
No insurance	1.4	2.3

Table B. The Nurse Manager Time Allocation by Type of Activity and by Type of Interaction

By Activity	Percent of Time	By Interaction	Percent of Time
Updating registry	25%	No personal interaction	38%
Charting	25%	With care coordinators	17%
Attending, preparing, and traveling to meetings	18%	With patients	16%
Discussing patient care	8%	With healthcare providers	12%
Placing orders	5%	With clinic support staff	3%
Requesting records	4%	With individuals not listed above	14%
Reviewing charts	3%		
Other	12%		

Table C. The Observed Utilization Patterns Among Patients With Coronary Heart Disease and Patients With Diabetes

Patient Study Groups:	Coronary Heart Disease			Diabetes		
	Pre-Implementation	Post Implementation	Percent Change	Pre-Implementation	Post Implementation	Percent Change
N	635	534		559	515	
Measure						
Visits, ^a n	9.2	8.7	-5.0%	8.9	8.9	-0.1%
Visits with providers, ^b n	4.4	4.0	-8.1%	4.2	4.0	-5.2%
Revenue per patient, \$	878 ^c	779 ^d	-11.3%	981	911	-7.2%
Revenue per office visit, ^a \$	109 ^c	104	-4.0%	124	113	-9.2%
Procedures, n	21.8	20.6	-5.7%	22.6	22.1	-2.1%
Revenue per procedure (all procedures), \$	44	43	-3.2%	47	44	-5.6%
Laboratory tests, ^e n	9.7	8.1 ^d	-16.7%	10.5	9.3	-10.9%

^aVisits include a visit for any reason, including visits exclusively for laboratory tests, and are counted as days with at least 1 procedure; if more than 1 visit occurred on a day, only the first visit is reflected in the visit count.

^bIncludes an office visit with a Current Procedural Terminology (CPT)-4 evaluation and management code in the range of 99201 through 99215.

^cStatistically different from diabetes patients at pre-implementation at the 5% or lower level.

^dStatistically different from diabetes patients at post implementation at the 5% or lower level.

^eIncludes CPT-4 codes 80047 through 89398.

Table D. The Observed and Predicted Utilization Patterns Among Patients With Coronary Heart Disease Pre-Implementation (N = 635) and Post Implementation (N = 534)

Measure	Observed Difference			Predicted Difference ^a		
	Period		Percent Change	Predicted Without Care Model Change	Predicted With Care Model Change	Predicted Percent Change
	Pre-Implementation	Post Implementation				
Visits, ^b n	9.2	8.7	-5.0%	9.1	8.8	-4.3%
Visits with providers, ^c n	4.4	4.0	-8.1%	4.4	4.3	-1.4%
Revenue per patient, \$	878	779	-11.3%	867	846	-2.5%
Revenue per office visit, ^a \$	109	104	-4.0%	108	114	5.7%
Procedures, n	21.8	20.6	-5.7%	21.7	21.1	-2.8%
Revenue per procedure (all procedures), \$	44	43	-3.2%	44	45	1.4%
Laboratory tests, ^d n	9.7	8.1	-16.7%	9.7	9.1	-5.6%

^aCalculated based on a difference in differences methodology.

^bVisits include a visit for any reason, including visits exclusively for laboratory tests, and are counted as days with at least 1 procedure; if more than 1 visit occurred on a day, only the first visit is reflected in the visit count.

^cIncludes an office visit with a Current Procedural Terminology (CPT)-4 evaluation and management code in the range of 99201 through 99215.

^dIncludes CPT-4 codes 80047 through 89398.