SPECIAL ARTICLE

A Randomized Trial of a Telephone Care-Management Strategy

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ABSTRACT

BACKGROUND

Studies have shown that telephone interventions designed to promote patients' self-management skills and improve patient–physician communication can increase patients' satisfaction and their use of preventive services. The effect of such a strategy on health care costs remains controversial.

METHODS

We conducted a stratified, randomized study of 174,120 subjects to assess the effect of a telephone-based care-management strategy on medical costs and resource utilization. Health coaches contacted subjects with selected medical conditions and predicted high health care costs to instruct them about shared decision making, self-care, and behavioral change. The subjects were randomly assigned to either a usual-support group or an enhanced-support group. Although the same telephone intervention was delivered to the two groups, a greater number of subjects in the enhanced-support group were made eligible for coaching through the lowering of cutoff points for predicted future costs and expansion of the number of qualifying health conditions. Primary outcome measures at 1 year were total medical costs and number of hospital admissions.

RESULTS

At baseline, medical costs and resource utilization were similar in the two groups. After 12 months, 10.4% of the enhanced-support group and 3.7% of the usual-support group received the telephone intervention. The average monthly medical and pharmacy costs per person in the enhanced-support group were 3.6% ($7.96) lower than those in the usual-support group ($213.82 vs. $221.78, P=0.05); a 10.1% reduction in annual hospital admissions (P<0.001) accounted for the majority of savings. The cost of this intervention program was less than $2.00 per person per month.

CONCLUSIONS

A targeted telephone care-management program was successful in reducing medical costs and hospitalizations in this population-based study. (Funded by Health Dialog Services; ClinicalTrials.gov number, NCT00793260.)

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Health care expenditures in the United States are high and continue to rise unabated.[1,2] A substantial proportion of these expenditures is unwarranted and could potentially be eliminated with no negative effect on the quality of care.[3-5] One strategy for reducing medical expenditures is to provide care management, including decision-making support.[6,7] Such interventions promote self-management skills and improve patient–physician communication, with the expectation that patients who are more engaged in their health care will become better consumers of health care services, thus leading to better outcomes at lower costs. Although the promise of such strategies has been well communicated, efforts to quantify the potential cost savings have been elusive.[8-12]

We postulated that a targeted, population-based care-management program that identified a greater number of persons for support, as compared with the usual approach to providing support, would reduce health care costs and resource utilization. We conducted a large, randomized, quality-improvement trial to assess the effectiveness of care-management strategies in reducing medical costs in an insured population.

METHODS

STUDY DESIGN AND OVERSIGHT

We tested two care-management strategies — usual support and enhanced support — in an insured patient population, through a collaboration between Health Dialog Services and two regional health plans. The primary difference between the two strategies was the extent of outreach, with predictive models used to target a larger proportion of subjects for outreach in the enhanced-support group. Once the patients had been contacted, the support provided to the two groups (i.e., personnel, training, tools, and collateral educational materials) was identical. The primary outcomes were total health care expenditures and utilization of health care services during a 1-year period.

We used a stratified randomization design. Within each of three health benefit designs (i.e., a health maintenance organization, a point-of-service plan, and a preferred-provider organization), the household member with the highest financial risk, as identified by claims-form codes (according to the *International Classification of Diseases, 9th Revision*), was assigned to one of several strata (see Tables 1 and 3 in the Supplementary Appendix, available with the full text of this article at NEJM.org). Within-stratum subjects were ranked according to their predicted medical costs and assigned, in alternating fashion, to one of two groups (A or B). To ensure that a household received the same level of outreach, the remaining household members were added to the same group (A or B) as the member determined to be at highest financial risk. Groups A and B were then randomly assigned to either the enhanced-support group or the usual-support group. Subjects were not aware of their group assignments. Health Dialog's services complied with the Health Insurance Portability and Accountability Act rules. Since this was a quality-improvement study, we did not initially seek approval from an institutional review board[13-16]; however, before submitting the manuscript for publication, we sent the study protocol to Maine Medical Center's institutional review board, which designated the study an exempt quality-improvement study and granted a waiver of informed consent.[14]

Health Dialog Services was directly involved in the design and conduct of the study; the collection, analysis, and interpretation of the data; and preparation of the manuscript. All authors contributed to the study concept and design; acquisition of the data; administrative, technical, and material support; and critical revision of the manuscript.

STUDY POPULATION

The study subjects had health insurance coverage through one of seven employers that had received Health Dialog's usual-support services for 1 to 4 years before the study (a state university system, a state employee group, a natural-resource extraction company, a public educational service agency, a nonprofit association of independent colleges, and two manufacturing companies). Of the 215,006 subjects initially identified by the use of claims data (Table 1 in the Supplementary Appendix), 34,629 were excluded before randomization because of missing or insufficient data and 667 because of high-cost medical conditions (acquired immunodeficiency syndrome, end-stage renal disease, conditions requiring transplantation, and necrotizing fasciitis) for which they were already

receiving support from the insurance plans. After randomization but before the start of the intervention, 5590 subjects became ineligible for plan coverage, resulting in a total of 174,120 subjects in the study (81% of the initial population) (Table 2 in the Supplementary Appendix).

PREDICTIVE MODELS

Health Dialog used a variety of predictive models to assess the likelihood that a subject would use or need health care services in the future.[17,18] The models predicted total costs of services, identified any gaps in effective care (e.g., missing preventive services), and predicted the likelihood of a surgical intervention for a preference-sensitive condition.[7] A preference-sensitive condition is one for which at least two valid, alternative treatment strategies are available. Since the risks and benefits of the options often differ, the choice of treatment involves trade-offs; therefore, the choice should depend on informed patients making decisions on the basis of their preferences and values (e.g., hip replacement for arthritis). The results consisted of rank-ordered lists, created at least monthly, of persons likely to need care support (see Overview of Predictive Models and Other High-Risk Targeting Modules in the Supplementary Appendix); these lists were then used to generate outbound mail, interactive voice-response calls, or calls by health coaches.

STUDY GROUPS

The main difference between the two study groups was the proportion of subjects receiving outreach. The number of subjects receiving outreach through interactive voice-response calls or calls from a health coach was greater in the enhanced-support group because for this group, we lowered the cutoff points for predicted health care costs or resource utilization among persons with chronic or preference-sensitive conditions and identified subjects without such conditions who were at high financial risk according to the predictive models (Table 1). The enhanced-support group received up to five outreach attempts versus three in the usual-support group (i.e., if the subject had not been contacted after three attempts, two additional attempts were made in the enhanced-support group). There was no difference between the groups in terms of outreach to persons under the age of 18 years.

CARE SUPPORT

The health-coach team for this study included registered nurses, licensed vocational nurses, dietitians, respiratory therapists, and pharmacists. Coaches generally teach self-care on many levels and make sure that patients understand and adhere to medication regimens by creating and reviewing drug lists.[19] Coaches contact patients who have been discharged from the hospital in order to review, explain, and reinforce discharge instructions. They also help motivate patients to make behavioral changes (e.g., dietary modification)[20-22] and teach patients how to engage in shared decision making (e.g., with regard to treatment options for arthritis of the hip).[23] (More details about coaching are included in the Supplementary Appendix.)

The coaches used person-centric software, developed jointly with the Foundation for Informed Medical Decision Making,[24] that provides consistent information and processes. They also supplemented telephone communication with the subjects by sending them Web links and video and print materials, including DVDs on shared decision making for preference-sensitive conditions.[7]

OUTCOMES

Primary outcomes were the cost of care and the use of hospital, emergency room, and outpatient services, as well as selected surgical procedures. Hospitalizations were further categorized as high-variation medical admissions (those for which there is a lack of consensus about the need for hospitalization),[25,26] admission for selected preference-sensitive surgical procedures (prostate, hip, knee, back, or uterine surgery and coronary revascularization), maternity admissions, pediatric admissions, and all other admissions.[27] Since preference-sensitive surgical procedures are also performed in outpatient settings, we assessed these rates regardless of the health care setting.

Outcome measures were derived from insurance-claims data from the health plans, including facility, professional, and pharmaceutical services. Claims for study participants who had health insurance coverage between July 1, 2005, and June 30, 2007, were included. Baseline analyses to assess the equality of randomization included claims with service dates from July 1, 2005, to June 30, 2006, and payment dates from July 1, 2005, to December 30, 2007. Outcomes were assessed on

Table 1. Risk Stratification, Outreach Criteria, and Coaching Techniques According to Cohort.

Cohort*	Stratification	Outreach Criterion	Coaching Technique
Subjects with selected chronic conditions (heart failure, CAD, COPD, diabetes, asthma)	Predicted financial risk based on linear regression models	Lower cutoff point for predicted future costs in enhanced-support group	Behavioral change and motivational counseling
Subjects with preference-sensitive conditions that put them at risk for surgical intervention (lumbar surgery, knee or hip replacement or repair, cardiac revascularization, prostatectomy for benign prostate hyperplasia, hysterectomy or myomectomy for benign conditions)†	Predicted risk of surgical intervention based on logistic-regression models	Lower cutoff point for predicted future costs in enhanced-support group	Shared decision making
Subjects with other high-risk conditions (cardiac arrhythmias, angina, obesity, tobacco use, depression or anxiety, hypertension with complications, back and neck pain, osteoarthritis, hyperlipidemia, abdominal pain) or with multiple hospital or emergency room visits‡	Predicted financial risk based on linear regression models	Enhanced-support group only	Behavioral change and motivational counseling
All others	—	—	—

* The cohorts were identified on the basis of claims data. CAD denotes coronary artery disease, and COPD chronic obstructive pulmonary disease.

† A preference-sensitive condition is one for which at least two valid, alternative treatment strategies are available. Since the risks and benefits of the options often differ, the choice of treatment involves trade-offs; therefore, the choice should depend on informed patients making decisions on the basis of their preferences and values. This group had none of the selected chronic conditions.

‡ This group had none of the selected chronic or preference-sensitive conditions.

the basis of claims with service dates from July 1, 2006, to June 30, 2007, and payment dates from July 1, 2006, to December 30, 2007 (more than 99% of claims were paid within 6 months). During the study, 13.8% of the enhanced-support group and 13.9% of the usual-support group discontinued or lost their coverage; since data were not available after disenrollment, outcomes for these group members were annualized.

We compared resource utilization in the enhanced-support group with that in the usual-support group by means of an intention-to-treat model. To reduce the effect of participants with extremely high costs, we capped the total annual medical (facility and professional) expenditures at $200,000 — a common level used for reinsurance purposes; 40 subjects in the enhanced-support group and 31 in the usual-support group had costs exceeding this amount. We tested the use of capping at the $100,000, $200,000, and $250,000 levels and found no differences in either point estimates or P values.

To assess the net results of the program, we estimated the total cost (not just the marginal cost) for the enhanced-support program at $2.00 per person per month. This figure included salaries and benefits for the coaches, training, amortized capital expenditures, data and coaching operations teams, fulfillment, and overhead.

STATISTICAL ANALYSIS

The primary prespecified analyses were total population costs and utilization of hospital and emergency room services. We performed several post hoc analyses to identify subgroups in which the effect of enhanced support was greatest. After outreach targeting but before examination of the results, we grouped all the subjects into one of four hierarchical cohorts on the basis of criteria used at the beginning of the study period: those with chronic conditions, those with preference-sensitive conditions (other than chronic conditions), those with high-risk conditions (other than preference-sensitive and chronic conditions), and all others (Table 1). (Details of the randomization strata, analytic cohorts, and analyses using the randomization strata are given in Tables 3, 4, 6, and 7 in the Supplementary Appendix.)

We used SAS software, version 9.1 (SAS Institute), for analyses. Baseline demographic and clinical characteristics were analyzed by means of chi-square tests for categorical variables and the Wilcoxon and Mann–Whitney tests for ranked variables. Health coach contacts, videos, coach

mailings, admissions, emergency room visits, and surgeries were analyzed with the use of Poisson regression[28] and generalized estimating equations,[29] with data clustered by household. We assessed costs using these equations, with data again clustered by household, with the use of untransformed cost as the dependent variable (allowing unbiased estimates of regression parameters for large data sets[30]) and study group (enhanced support vs. usual support) as the independent variable. Baseline cost, resource utilization, predicted future cost, and demographic characteristics were all nearly equal between the two groups; however, we conducted a variety of analyses to confirm that adjustment for any slight baseline differences between the study groups would not alter the results (Tables 5 and 7 in the Supplementary Appendix).

An alpha level of 0.05 was considered to indicate statistical significance. The study was designed to have 80% power to detect a difference in total cost between the enhanced-support group and the usual-support group, relative to the usual-support group alone, of at least 3%. An independent statistical analysis was performed that consisted of a review of the randomization of the study cohort, a review of the creation of the analytic data set (including data checks), and duplication of the primary outcomes.

RESULTS

BASELINE CHARACTERISTICS OF THE SUBJECTS AND OUTREACH

Table 2 shows the baseline characteristics of the 174,120 subjects in the study. The two groups were similar with respect to demographic characteristics, chronic health conditions, risk for preference-sensitive surgeries, medical costs, and use of hospital services at baseline. By design, more subjects in the enhanced-support group were targeted (25.8%, vs. 7.8% in the usual-support group) and coached (10.4%, vs. 3.7% in the usual-support group). Subjects with selected chronic conditions received the most coaching, followed by those with preference-sensitive conditions and those with additional high-risk conditions (Table 3).

COSTS AND UTILIZATION OF MEDICAL RESOURCES

During the 1-year follow-up period, the costs for facility and professional services were $8.48 per person per month lower in the enhanced-support group than in the usual-support group — a reduction of 4.4% in health care expenditures for the total population (P=0.03) (Table 4). Pharmacy costs were $0.52 per person per month higher in the enhanced-support group, resulting in an overall expenditure reduction of $7.96 per person per month (P=0.05). With the intervention costing less than $2.00 per person per month, the net savings was $6.00 per person per month.

The lower health care costs in the enhanced-support group were primarily due to reduced inpatient and outpatient hospital expenditures (reductions of $6.04 and $1.61 per person per month, respectively) (Fig. 1). The hospital admission rate was 10.1% lower in the enhanced-support group than in the usual-support group (P<0.001) (Table 4). This reduction was almost entirely accounted for by a 13.3% population-based reduction in admissions for high-variation medical conditions (P=0.002) and an 11.5% reduction in admissions for preference-sensitive conditions (P=0.03). No significant differences in maternity, pediatric, or other admissions were found (data not shown).

The enhanced-support group had significantly fewer admissions than did the usual-support group in two of the four outreach cohorts: subjects with chronic conditions (13.7%, P=0.02) and those with other high-risk conditions (11.8%, P=0.04) (Table 4). This group also had slightly fewer emergency room visits. Emergency room visits resulting in an admission were considered part of the admission. (Additional analyses are provided in Tables 5, 6, and 7 in the Supplementary Appendix.)

The number of surgical procedures performed for the six targeted preference-sensitive conditions in either the inpatient or outpatient setting was 9.8% lower in the enhanced-support group than in the usual-support group (P=0.04) (data not shown). We found no significant difference between the two groups with respect to effective care measures (laboratory tests or pharmacy services).

DISCUSSION

The intervention in the enhanced-support group reduced total health care costs by 3.6% as compared with the savings generated by the usual-support program. These savings were driven by a reduction of 10% in the population-based admission rates in the enhanced-support group. The re-

Table 2. Baseline Characteristics of the Study Population.*

Characteristic	Usual-Support Group	Enhanced-Support Group
Demographic characteristics		
Total population — no. (%)	87,243 (50.1)	86,877 (49.9)
Female sex — no. (%)	45,196 (51.8)	44,918 (51.7)
Mean no. of members in household	2.13	2.12
Mean age — yr	37.2	37.3
Age group — no. (%)		
0–17 yr	20,170 (23.1)	20,039 (23.1)
18–39 yr	21,403 (24.5)	21,201 (24.4)
40–55 yr	28,366 (32.5)	28,027 (32.3)
56–64 yr	13,726 (15.7)	14,072 (16.2)
≥65 yr	3,578 (4.1)	3,538 (4.1)
Chronic condition or risk of need for surgery — no. (%)		
Chronic condition		
Any	8,515 (9.8)	8,465 (9.7)
Heart failure	269 (0.3)	274 (0.3)
Chronic obstructive pulmonary disease	609 (0.7)	626 (0.7)
Coronary artery disease	1,878 (2.2)	1,918 (2.2)
Diabetes	4,430 (5.1)	4,449 (5.1)
Asthma	2,795 (3.2)	2,720 (3.1)
Risk of need for surgery		
Cardiac revascularization	4,695 (5.4)	4,706 (5.4)
Lumbar surgery	3,466 (4.0)	3,535 (4.1)
Hip surgery	1,522 (1.7)	1,542 (1.8)
Knee surgery	3,480 (4.0)	3,535 (4.1)
Hysterectomy	1,497 (1.7)	1,446 (1.7)
Prostatectomy	498 (0.6)	496 (0.6)
Mean financial-risk percentile		
All subjects†	49.7	49.8
Highest-risk member from each household†	60.2	60.2
Subjects with chronic disease†	49.4	49.6
Resource utilization — no./1000 persons/yr		
Admissions	71.0	69.9
Emergency room visits	242.5	242.8
Average medical and pharmacy costs — $/person/mo‡		
Medical	169.16	168.62
Pharmacy	26.39	26.37
Medical plus pharmacy	195.55	194.99

* P>0.13 for all comparisons between the usual-support group and the enhanced-support group.
† Group members were ranked according to their financial-risk score in the total population or in the chronic-condition population initially identified; scores were assigned to a percentile, and the average percentiles are shown.
‡ Medical costs are capped at $200,000 per person.

Table 3. Health Coach Activity and Outreach According to Cohort and Study Group.

Cohort and Study Group*	No. of Subjects	Subjects Targeted for Coach Contact†	Coach Contacts‡	Subjects Contacted by Coach	Videos Sent	Coach Mailings
		%	*no./1000 persons/yr*	%	*no./1000 persons/yr*	
All subjects						
Usual support	87,243	7.8	79.3	3.7	3.8	35.3
Enhanced support	86,877	25.8	233.0	10.4	12.2	125.3
Subjects with selected chronic conditions						
Usual support	8,515	34.4	331.1	15.9	16.8	194.2
Enhanced support	8,465	76.1	978.7	39.8	41.4	605.5
Subjects with preference-sensitive conditions that put them at risk for surgical intervention						
Usual support	9,161	18.2	113.1	6.3	11.4	55.4
Enhanced support	9,190	59.5	398.5	22.2	41.1	240.2
Subjects with other high-risk conditions						
Usual support	19,446	5.5	53.1	2.8	2.2	20.8
Enhanced support	19,364	30.9	183.5	10.8	12.7	105.1
All other subjects						
Usual support	50,121	2.3	27.6	1.5	0.7	8.3
Enhanced support	49,858	9.1	57.5	3.1	1.6	23.9

* Data are shown for cohorts at baseline; during the study year, subjects could move among the outreach cohorts (the largest number of moves was out of the "all other subjects" cohort into the "preference-sensitive conditions" or "other high-risk conditions" cohort) but not between the two study groups.

† Targeted subjects were directly telephoned by coaches or were called by an interactive voice-response system and given the option to transfer to a coach.

‡ Contacted subjects included only those who spoke with a coach. All differences between the usual-support and the enhanced-support groups were significant ($P<0.001$).

ductions occurred in high-variation medical admissions and preference-sensitive admissions targeted by the enhanced-support intervention.

Previous efforts to evaluate interventions for care support have had mixed results.[8,31-35] In a comprehensive study of 15 care-coordination demonstration projects initiated by the Centers for Medicare and Medicaid Services, Peikes et al. found a significant reduction in costs in only 2 of the projects, and the savings did not cover the project costs.[12] One meta-analysis showed that care support generally improves clinical outcomes but has mixed effects on cost or resource utilization.[36] A meta-analysis of randomized trials of comprehensive discharge planning for elderly patients with high-risk heart failure showed a reduction in readmission rates.[37] DeBusk et al. extended this model to patients at lower risk and found no benefit.[38] A study of the Medicare Health Support chronic disease pilot program showed no differences in costs between the intervention and control groups.[16] This study included only beneficiaries at high risk (many living in nursing homes) who had received a diagnosis of diabetes or heart failure 18 months or more before the intervention, and it lacked timely claims and administrative data.

We designed our study to determine whether a care-support program could reduce costs, not to determine which specific components accounted for the savings. However, several differences between our program and other programs described in the literature may provide important insights. We used an opt-out model (i.e., subjects received care support unless they requested that it not be provided). By avoiding a long recruitment process,

we could simultaneously engage subjects and intervene while achieving a very low refusal rate. This model is also easier to implement on a larger scale.[15]

The population-based approach allowed us to consider a broad group of subjects for intervention. Continuously refreshing the output of the predictive models and using real-time administrative-data feeds, such as discharge notifications (which are issued at a time when patients are particularly receptive to coaching), enabled our care-support program to dynamically target specific interventions to subjects who were likely to incur modifiable future costs — an opportunity that was not available in many previous studies.[1,12,15] The flexible, total-population approach also allowed us to focus our efforts on patients who were neither too sick nor too well for telephone-based care, thus reducing the investment when telephone support is not likely to be of benefit (e.g., in the case of patients who live in a nursing home or have catastrophic ill-

Table 4. Resource Utilization and Costs According to Cohort and Study Group.

Cohort and Variable	Usual-Support Group	Enhanced-Support Group	Difference (Enhanced Support minus Usual Support)		P Value
			Absolute	Relative	
				%	
Total study population					
No. of subjects	87,243	86,877			
No. of person-months of follow-up	970,264	966,848			
Hospital admissions (no./1000 persons/yr)	74.0	66.5	−7.5	−10.1	<0.001
Emergency room admissions (no./1000 persons/yr)	253.8	250.2	−3.6	−1.4	0.41
Average medical and pharmacy costs ($/person/mo)*					
Medical	190.90	182.42	−8.48	−4.4	0.03
Pharmacy	30.88	31.40	0.52	1.7	0.41
Medical plus pharmacy	221.78	213.82	−7.96	−3.6	0.05
Subjects with selected chronic conditions					
No. of subjects	8,515	8,465			
No. of person-months of follow-up	96,327	95,288			
Hospital admissions (no./1000 persons/yr)	226.3	195.3	−31.0	−13.7	0.02
Emergency room admissions (no./1000 persons/yr)	502.3	491.5	−10.8	−2.1	0.61
Average medical and pharmacy costs ($/person/mo)*					
Medical	494.07	443.40	−50.67	−10.3	0.02
Pharmacy	84.18	83.73	−0.45	−0.5	0.87
Medical plus pharmacy	578.25	527.13	−51.12	−8.8	0.02
Subjects with preference-sensitive conditions that put them at risk for surgical intervention					
No. of subjects	9,161	9,190			
No. of person-months of follow-up	103,894	104,612			
Hospital admissions (no./1000 persons/yr)	131.1	122.1	−9.0	−6.9	0.28
Emergency room admissions (no./1000 persons/yr)	358.3	341.6	−16.7	−4.7	0.28
Average medical and pharmacy costs ($/person/mo)*					
Medical	376.74	360.17	−16.57	−4.4	0.29
Pharmacy	48.64	49.25	0.61	1.3	0.78
Medical plus pharmacy	425.38	409.42	−15.96	−3.8	0.32

Table 4. (Continued.)

Cohort and Variable	Usual-Support Group	Enhanced-Support Group	Difference (Enhanced Support minus Usual Support)		P Value
			Absolute	Relative %	
Subjects with other high-risk conditions					
No. of subjects	19,446	19,364			
No. of person-months of follow-up	218,059	217,452			
Hospital admissions (no./1000 persons/yr)	79.0	69.7	−9.3	−11.8	0.04
Emergency room admissions (no./1000 persons/yr)	290.3	287.5	−2.8	−1.0	0.76
Average medical and pharmacy costs ($/person/mo)*					
Medical	222.73	215.76	−6.97	−3.1	0.39
Pharmacy	38.04	39.05	1.01	2.7	0.47
Medical plus pharmacy	260.77	254.81	−5.96	−2.3	0.47
All other subjects					
No. of subjects	50,121	49,858			
No. of person-months of follow-up	551,984	549,496			
Hospital admissions (no./1000 persons/yr)	35.3	32.8	−2.5	−7.0	0.14
Emergency room admissions (no./1000 persons/yr)	172.4	172.6	0.2	0.1	0.97
Average medical and pharmacy costs ($/person/mo)*					
Medical	90.91	90.43	−0.48	−0.5	0.88
Pharmacy	14.99	15.45	0.46	3.1	0.42
Medical plus pharmacy	105.90	105.88	−0.02	0	0.99

* Medical costs were capped at $200,000 per person.

nesses) or to result in decreased costs (e.g., in the case of patients with well-controlled diabetes and no gaps in care).[1,12,15]

Our intervention included shared decision making for subjects with preference-sensitive conditions, whereas previous studies focused primarily on subjects with chronic illnesses. Provider-based studies of preference-sensitive care have consistently shown that decision-making support results in fewer interventions than usual support.[7] Our study adds to these investigations by assessing the effect of a population-based telephone intervention to provide decision-making support.

Several limitations of this study should be considered. Although the study population consisted of employees of seven geographically and occupationally diverse organizations, the results may not be generalizable to other populations. The group studied was a commercially insured population; however, 7000 of the subjects were 65 years of age or older. We assessed medical cost savings from the perspectives of the health plan and the employer, thus underestimating the overall financial effect of the intervention: decreased resource utilization resulted in reductions in out-of-pocket deductible expenses and copayments for persons in the enhanced-support group. Medicare was the primary insurer for most of the subjects who were 65 years of age or older, and we estimate that over half the savings in such cases accrued to this publicly funded program. We could not analyze mortality or changes in functional status, owing to a lack of data.

This study is a comparative-effectiveness study in that it assessed the marginal benefits of the intervention in the enhanced-support group as compared with the usual-support program. We cannot assess the savings of the entire program. From a sensitivity perspective, if the usual-support program resulted in no savings, the employer and

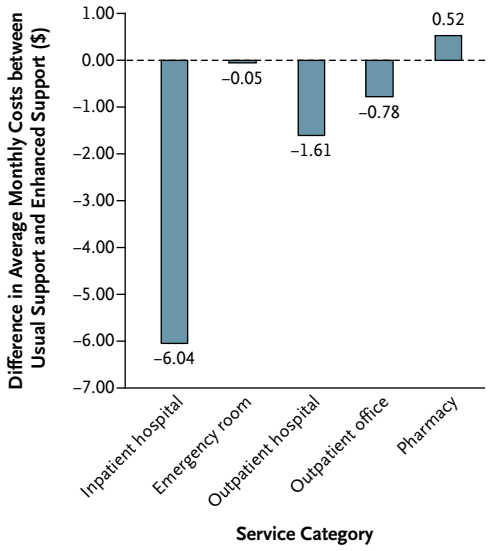

Figure 1. Differences in Average Monthly Medical Costs between Enhanced and Usual Support, According to Service Category.

The dollar values were obtained by subtracting the monthly cost of usual care from that of enhanced care. Greater cost savings were achieved in the enhanced-support group in all categories except pharmacy expenses.

health plan would still realize more than a 4-to-1 return on their investment. It remains to be seen whether our results are generalizable to larger populations over longer time periods.

Care support has been proposed as one component of the remedy for runaway health care costs. This study shows that an analytically driven, targeted, population-based program can decrease hospitalizations and surgical procedures and thereby reduce total medical costs for the population as a whole. The reductions in resource utilization were within the categories one would expect, given the intervention: high-variation medical admissions and preference-sensitive surgical admissions. Although not a panacea, a scalable intervention that substantially reduces expenditures by supporting patient involvement in the decision-making process could be an effective component of health care reform.[39]

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