Can Disease Management Reduce Health Care Costs By Improving Quality?

We cannot reduce costs by improving quality unless treatments for the chronically ill are themselves cost-saving.

by Bruce Fireman, Joan Bartlett, and Joe Selby

PROLOGUE: During the past decade disease management programs (DMPs) have been sweeping the country. In 2000 a survey of forty-five health plans revealed that more than half had such programs in place a scant few years after the concept began to emerge. Disease management has become a buzzword in government and foundation pilot programs. The expectations were that DMPs, by providing better communication, management, and follow-up for patients with chronic and costly conditions, could ultimately lower health care costs by eliminating some hospital stays and emergency room visits. Reports from the field, however, have tempered this enthusiasm. The great hopes engendered by disease management—that more consistent intervention in chronic illnesses and better treatment using clinical guidelines from evidence-based medicine would lower costs—have yet to be realized. Health care, like many other institutions and agencies, has found that "better" and "cheaper" do not always partner well.

This paper highlights the actual experience of a Kaiser Permanente program and the promise of disease management. The authors detail a Kaiser Permanente program in Northern California that incorporated DM principles into an already multidisciplinary practice for patients with coronary artery disease, heart failure, diabetes, and asthma. Actual cost savings were elusive, they find, but the program could have sizable potential savings. The authors caution that the "rationale for DM must rest on its effectiveness and value regardless of whether it saves money." All three authors are affiliated with the Permanente Medical Group, Northern California, in Oakland, at its Division of Research where Bruce Fireman (Bruce .Fireman@kp.org) is a senior biostatistician and health services researcher; Joan Bartlett, a senior consultant and health services researcher; and Joe Selby, director of the division.

In an accompanying Perspective, Jay Crosson and Philip Madvig of the Permanente Federation and the Permanente Medical Group, respectively, describe the stringent definitions used in the study by Fireman and colleagues; they suggest that its design may have concealed actual savings.

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ABSTRACT: Disease management (DM) promises to achieve cost savings by improving the quality of care for chronic diseases. During the past decade the Permanente Medical Group in Northern California has implemented extensive DM programs. Examining quality indicators, utilization, and costs for 1996–2002 for adults with four conditions, we find evidence of substantial quality improvement but not cost savings. The causal pathway—from improved care to reduced morbidity to cost savings—has not produced sufficient savings to offset the rising costs of improved care. We conclude that the rationale for DM programs, like the rationale for any medical treatments, should rest on their effectiveness and value.

CHAMPIONS OF DISEASE MANAGEMENT (DM) promise cost savings—or a positive return on investment—by improving the quality of care for patients with chronic diseases in ways that prevent costly complications and exacerbations. During the past decade the Permanente Medical Group (TPMG) in Northern California has implemented extensive DM programs for coronary artery disease (CAD), heart failure, diabetes, and asthma. The business case for these programs expected savings on a causal pathway from quality improvement to morbidity prevention to savings; the costs of improving compliance with treatment guidelines would be more than offset by reduced hospital costs. We evaluated the extent of quality improvement and whether the promise of savings has been achieved.

Purchasers hope that DM can be a "win-win" strategy that will improve quality and reduce costs in ways that are welcomed by patients and physicians.[1] When asked about cost containment strategies, about 66 percent of respondents to the 2003 Employer Health Benefits Survey rated DM as likely to be very or somewhat effective.[2] Many health plans now have DM programs.[3] More than twenty states are administering DM programs for their Medicaid recipients, and Medicare DM demonstration programs are under way.[4] The idea that DM can improve quality and reduce costs has intuitive appeal and support from numerous studies yet remains controversial.[5]

Background

■ **Study setting.** TPMG is a multispecialty group practice that provides comprehensive medical services to the three million members of Kaiser Permanente in Northern California. This health plan population is ethnically diverse, similar to California in age distribution, but somewhat underrepresentative of the poor.

■ **DM programs.** TPMG's DM programs include clinical guidelines, patient self-management education, disease registries, risk stratification, proactive outreach, reminders, multidisciplinary care teams, and performance feedback to providers. These components are integrated in a comprehensive effort to help clinicians plan and deliver evidence-based care and to help patients play an active and informed role in caring for themselves. Most DM components are embedded in the delivery of usual primary care; others are delivered by care managers hired specifically to augment services for patients whose conditions are poorly controlled in usual care.

Care managers are trained in the clinical management of the disease and in behavior change. Targeted patients receive three to twelve months of medical management and self-care coaching that is more intensive than in usual care. Medication protocols, DM software, and supervising physicians guide clinical decisions. Communication scripts and self-care protocols guide efforts to help patients take better care of themselves. Patients get frequent structured follow-up, primarily by telephone. TPMG also provides case management to patients with complex needs. While care managers provide direct patient care, case managers address coordination and appropriate use of hospital, home, and community services.

The DM programs were developed and implemented gradually; there is no distinct demarcation separating the time before DM from the time after DM. Our evaluation begins in 1996 because from this point forward we can define populations and track quality, use, and costs consistently and comprehensively.

Some DM components predate our study period (including care manager services in some medical centers). The use of information technology for targeting, monitoring, and outreach improved incrementally during the study period. About 120 behavioral medicine specialists and clinical health educators were added to primary care teams in 1997–1999 to support self-care, in part for members with the four diseases we study here.

In 1998 TPMG implemented a major effort to standardize and expand care manager services. By 2002 more than 250 full-time equivalents (FTEs) provided care management to targeted patients with CAD, heart failure, diabetes, and asthma, and an additional 122 FTEs provided cholesterol management or case management. By 2002, 20 percent of CAD patients, 24 percent of heart failure patients, 23 percent of diabetes patients, and 14 percent of asthma patients had received care management from DM programs. Also, cholesterol care managers had reached 43 percent of CAD patients, 25 percent of heart failure patients, and 25 percent of diabetes patients.

■ **Chronic disease populations.** Adults with the four conditions were identified from clinical databases using criteria that were applied consistently each year. By 2002 the size of the populations ranged from about 25,000 patient years with heart failure to 160,000 patient years with diabetes (Exhibit 1). The percentages of the populations in 1996 who stayed in the health plan until death or through 2002 were 87, 91, 80, and 64 for CAD, heart failure, diabetes, and asthma, respectively. The mean ages in 2002 were 69, 72, 59, and 42, respectively.

Study Methods

■ **Measures of quality.** Quality indicators measure the use of recommended tests and medications, and the control of risk factors. Medication use, laboratory results, and (starting in 2000) blood pressures were obtained from automated databases for all patients in the chronic disease populations.

We assessed lipid management for CAD and diabetes; glycemic management

EXHIBIT 1
Kaiser Permanente Patients Identified As Having Coronary Artery Disease, Heart Failure, Diabetes, And Asthma, 1996–2002

	1996	1998	2000	2002
Coronary artery disease				
Patient years	49,380	55,454	60,947	69,615
Prevalence	29.6	29.8	29.6	31.1
Heart failure				
Patient years	16,399	18,914	22,070	25,360
Prevalence	10.4	10.6	10.9	11.3
Diabetes				
Patient years	85,176	104,699	131,800	160,202
Prevalence	48.9	54.4	63.3	71.5
Asthma				
Patient years	32,246	38,540	39,923	45,000
Prevalence	22.3	24.3	24.1	25.7

SOURCE: Kaiser Permanente, Northern California.
NOTES: Prevalence is per 1,000 member-years age 18 and older, except for asthma, which is limited to ages 18–59. For each condition, prevalence is age-sex adjusted by direct standardization to the 2002 health plan population.

for diabetes; and blood pressure management for CAD, heart failure, and diabetes. We also measured use of angiotensin-converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs) for heart failure and diabetes, beta-blockers for heart failure and for the subset of CAD patients with a heart attack or revascularization procedure, and "long-term-control" and "quick-relief" medications for asthma. For each medication we examined the percentage of patients receiving any of the medication and those patients' median days' supply. For antihypertensives, we let each patient have up to 365 days' supply in each of five drug classes and then summed the supply across the five classes.[6] We assessed trends in obesity, physical inactivity, and smoking using the Adult Member Health Survey. Stratified random samples of members were mailed questionnaires in 1996, 1999, and 2002. For each year, approximately 17,000 surveys were completed, including 2,300–3,300 from adults with the four targeted conditions. The response rate was about 50 percent.

■ **Measures of costs and use.** The use and direct costs of medical services were tabulated annually for each of the 2.5 million adults in the health plan. We counted clinic visits, emergency room (ER) visits, and hospital admissions and days. Costs were summed in five categories: clinic (including laboratory and imaging), ER, hospital, outpatient pharmacy, and other (including durable medical equipment and skilled nursing facilities). The costs of services were obtained from the health plan's Cost Management Information System, which integrates utilization data with the financial ledger. All costs except for insurance-related functions are fully allocated to patients. Costs of a service are the same regardless of whether the patient pays nothing or a copayment. The costs for services delivered by outside providers were

the amounts that the health plan paid these providers.

■ **Analytic approach.** We compared costs for patients with each disease with average costs for adults—of the same age and sex and served by the same medical center—without the disease. Patients newly diagnosed with a condition were considered to have had it for the entire year. The comparison group for each condition is adults without that condition (rather than adults with no conditions).

We calculated costs per person year, dividing total costs by total person-years. Members who disenrolled or died were included only for the months they were enrolled and alive. Quality indicators, however, were assessed only for patients continuously enrolled for the year.

Costs are reported in 2002 dollars using the Consumer Price Index (CPI, All Items, All Urban Consumers).[7] For each chronic disease population and its comparison group, all measures of quality, use, and costs were standardized to the 2002 age-sex distribution of the chronic disease population.

We examined cost trends in relation to quality trends for each of the four conditions in the entire health plan population. For each condition, we then examined whether medical centers with more favorable quality trends experienced more favorable cost trends. For this analysis we created a summary quality index for each condition based on several quality indicators. For each condition, the eighteen medical centers were ranked according to the trend in the quality index and also the trend in costs.

Study Results

■ **Quality indicators.** The percentage of patients receiving recommended tests and medications increased for each condition (Exhibit 2). Lipid monitoring increased markedly for CAD and diabetes, and glycemic monitoring increased for diabetes. The percentage of patients taking statins, ACE inhibitors, and beta-blockers also increased substantially. Patients increasingly received more than one class of antihypertensive medications, raising the total days' supply.

Median LDL ("bad" cholesterol) improved from 125 to 99 among tested CAD patients and from 132 to 108 among tested diabetes patients. Blood pressure (BP) was unavailable in automated data prior to 2000, but from 2000 to 2002 the percentage of CAD patients with BP below 140/90 increased from 58 percent to 68 percent, that of heart failure patients with systolic BP below 130 increased from 45 percent to 51 percent, and that of diabetes patients with BP below 130/80 increased from 28 percent to 35 percent.

Improvement in lipid and BP control appears to have been accomplished more by medications than by weight management and exercise. From 1996 to 2002 obesity increased from 32 percent to 39 percent of patients with any of the four chronic diseases, while frequency of self-reported exercise did not change. Similar changes in obesity and exercise were observed among adults without these conditions. Among the chronically ill, smoking rates remained at about 11 percent.

EXHIBIT 2
Quality Indicators Among Kaiser Permanente Patients Identified As Having Coronary Artery Disease, Heart Failure, Diabetes, And Asthma, 1996–2002

Condition/quality indicator	1996	1998	2000	2002
Coronary artery disease				
LDL test				
Any	44%	61%	75%	86%
Median LDL	125	113	104	99
Statin medication				
Any	27%	43%	60%	73%
Median days	277	306	318	324
Antihypertensive medication				
Any	81%	83%	87%	90%
Median days	431	472	547	609
Coronary artery disease subset				
Beta-blocker medication				
Any	44%	54%	66%	76%
Median days	292	302	316	323
Heart failure				
Antihypertensive medication				
Any	93%	95%	96%	96%
Median days	618	666	714	762
ACE inhibitor or ARB				
Any	62%	68%	73%	76%
Median days	328	340	338	332
Beta-blocker medication				
Any	18%	27%	44%	59%
Median days	247	268	296	315
Diabetes				
HbA1c test				
Any	69%	75%	83%	87%
LDL test				
Any	28%	43%	65%	82%
Median LDL	132	123	116	108
Statin medication				
Any	10%	16%	27%	45%
Median days	267	276	275	279
Antihypertensive medication				
Any	58%	63%	69%	72%
Median days	392	417	449	494
ACE inhibitor or ARB				
Any	32%	41%	51%	57%
Median days	326	327	324	325
Asthma				
Inhaled corticosteroid				
Any	72%	80%	83%	85%
Median days	84	95	99	103
Long-acting inhaled beta$_2$ agonist				
Any	4%	11%	17%	23%
Median days	101	99	100	107
Short-acting inhaled beta$_2$ agonist				
Any	90%	90%	89%	89%
Median days	106	95	88	72

SOURCE: Kaiser Permanente, Northern California.

NOTES: Median LDL value is calculated for tested patients. Median days refers to the supply of medication among patients receiving any medication. The "coronary artery disease subset" is patients with a heart attack or revascularization procedure during the previous 5 years (approximately 45 percent of the coronary artery disease population each year). ACE is angiotensin-converting enzyme. ARB is angiotensin II receptor blocker. We were not able to evaluate regional trends in hemoglobin A1c (HbA1c) because of changes during the study period in laboratory assays and the reference method of standardizing results.

For asthma, the use of recommended "long-term-control" medications went up, while the use of "quick-relief" medications went down. The percentage of patients who used any inhaled corticosteroids increased, and days' supply increased, which suggests improved compliance. While the percentage of asthma patients receiving short-acting inhaled beta$_2$-agonists stayed high, days' supply declined 32 percent, which suggests improved symptom control.

■ **Costs and use.** Costs rose for each of the four conditions during the study period (Exhibit 3). After adjustment for age, sex, and inflation, annual costs for CAD patients, for example, rose $2,110, or 19 percent. Among adults without the conditions, costs increased by fewer real dollars yet by greater or equal percentages. For patients with and without the four conditions, costs rose in each of the five categories (data not shown). The only exception was hospital costs among diabetes patients, which stayed the same. Increases were steepest for pharmacy costs and least for hospital costs.

There were similarities in use and cost trends among adults with the four conditions, as well as among comparison adults (Exhibit 4). Drug costs soared. Visits to doctors decreased, but visits to other clinicians increased, so that total visits rose (except for asthma). ER visits declined. The cost per clinic visit rose, and the cost per ER visit rose more. Patients spent as many or more days in the hospital in 2002 as in 1996. Length of hospital stays increased more than admission rates.

Hospital admissions increased less on a percentage basis in the chronic disease populations than in their comparison populations, and, with the exception of heart failure, so did hospital days. Diabetes and asthma patients had fewer hospitalizations in 2002 than in 1996, even as hospital days stayed about the same. Heart failure and CAD patients had more hospital days in 2002 than in 1996, and the increase amounted to 967 hospital days per thousand heart failure patients

EXHIBIT 3
Total Costs (In 2002 Dollars) Among Patients With Each Condition Compared With Demographically Similar Patients Without The Condition, 1996–2002

					Change from 1996 to 2002	
Population	**1996 ($)**	**1998 ($)**	**2000 ($)**	**2002 ($)**	**Dollars**	**Percent**
Coronary artery disease	11,274	12,107	12,148	13,385	2,110	19
Coronary artery disease comparison	3,274	3,512	3,694	4,206	932	28
Heart failure	16,392	18,591	17,888	19,922	3,530	22
Heart failure comparison	3,930	4,224	4,431	5,018	1,088	28
Diabetes	6,763	7,144	7,021	7,600	837	12
Diabetes comparison	2,702	2,817	2,909	3,365	663	25
Asthma	3,464	3,606	3,778	4,395	932	27
Asthma comparison	1,670	1,675	1,758	2,117	447	27

SOURCE: Kaiser Permanente, Northern California.

EXHIBIT 4
Visits, Hospital Use, And Pharmacy Costs, 1996–2002

Condition/service type	1996	1998	2000	2002	Percent change, 1996–2002: Condition	Percent change, 1996–2002: Comparison
Coronary artery disease						
All clinic visits	13.5	13.8	15.1	15.7	17	9
Physician clinic visits	9.1	8.7	8.5	8.4	−8	−7
Emergency room visits	1,106	1,103	1,046	1,001	−9	−15
Inpatient admissions	624	669	645	632	1	9
Inpatient days	2,854	3,057	2,995	3,149	10	21
Pharmacy costs	$815	$987	$1,176	$1,314	61	71
Heart failure						
All clinic visits	16.5	17.4	19.6	21.1	27	10
Physician clinic visits	11.4	11.0	10.8	10.5	−8	−6
Emergency room visits	1,831	1,929	1,778	1,689	−8	−11
Inpatient admissions	995	1,126	1,051	1,038	4	12
Inpatient days	4,594	5,444	5,109	5,561	21	22
Pharmacy costs	$1,117	$1,345	$1,575	$1,748	56	73
Diabetes						
All clinic visits	11.8	12.1	12.9	13.0	10	5
Physician clinic visits	7.8	7.2	7.0	6.8	−13	−9
Emergency room visits	693	667	600	557	−20	−18
Inpatient admissions	296	310	285	276	−7	3
Inpatient days	1,428	1,515	1,425	1,443	1	11
Pharmacy costs	$817	$953	$1,114	$1,143	40	66
Asthma						
All clinic visits	11.7	11.3	11.4	11.2	−5	1
Physician clinic visits	6.5	5.9	5.7	5.6	−14	−10
Emergency room visits	733	583	521	466	−36	−25
Inpatient admissions	117	116	111	109	−7	1
Inpatient days	431	469	425	439	2	10
Pharmacy costs	$715	$771	$962	$1,084	52	63

SOURCE: Kaiser Permanente, Northern California.

NOTES: Clinic visits and pharmacy costs (in 2002 dollars) are per person-year. Emergency room visits, inpatient admissions, and inpatient days are per 1,000 person-years. Hospital outpatient days are not shown to save space.

and 295 per thousand CAD patients. Trends in inpatient use were not smooth during the study period because inpatient use was high in 1998, so some findings are sensitive to the choice of baseline year. ER visits decreased by a greater percentage for asthma patients than for their comparison group.

■ **Quality and costs across medical centers.** Although quality improved and costs rose at all eighteen centers, levels and trends of quality and costs varied greatly among them. However, there was no tendency for costs to increase less at medical centers where quality improved more. Nor did costs at the end of the study period tend to be lower at centers where quality indicators were higher.

Discussion

In each of the four chronic disease populations, trends in quality indicators were favorable, but costs did not decrease; instead, they substantially increased. We conclude that DM is a promising approach to quality improvement but that quality improvement did not reduce costs. We address three related questions.

■ **Would costs have increased even more without the DM programs?** The predicted reduction in real costs did not occur. However, some evaluators assume that DM is responsible for any difference in percentage change between the costs of patients with the disease versus the costs of patients without the disease.[8] By this assumption, we could conclude that without DM, costs for the CAD population would have increased 28 percent rather than 19 percent from 1996 to 2002, and so DM arguably saved $77 million for this condition in 2002 alone ($1,100 per patient × 69,615 patients). Using this method for all four conditions, we could conclude that DM saved more than $200 million in 2002. We do not make this claim because there are plausible reasons apart from DM that can account for the slower percentage rise in costs for these chronic disease populations.

Hospital costs rose by a lower percentage than other costs. Therefore, total costs should increase by a lower percentage in patients with CAD or heart failure, for whom hospital costs account for nearly 60 percent of total costs, than in their healthier comparison populations, for whom hospital costs account for much lower percentages of total costs. Percentage cost increases in these two populations were closer to their comparison populations within the five cost categories than in total costs. If DM drives the trend within each cost category rather than the trend in total costs, then the purported savings are reduced by 56 percent for heart failure patients and by 35 percent for CAD patients.

We also compared trends in the costs of members with heart failure to trends in the costs of members with chronic obstructive pulmonary disease (COPD), which has a similar age and cost distribution. Although there has been no DM program for COPD (except for a guideline in December 2001), the rise in cost per patient has been similar to that for heart failure patients in specific service categories and in total costs (up 23 percent for COPD, 22 percent for heart failure). Without DM, costs rose less for COPD patients than for adults of similar ages without COPD.

With regard to diabetes, we need to take into account the 46 percent increase in prevalence, from 4.9 percent in 1996 to 7.2 percent in 2002. As screening and diagnostic practices became more aggressive during the study period, the median initial fasting glucose level of newly diagnosed diabetics decreased from 180 to 140 mg/dL. By 2002 the diabetes population included many more patients whose diabetes was at a relatively early stage, who would have been undiagnosed in 1996. This may help explain why hospital days increased only 1 percent in the diabetes population, and total costs increased 12 percent, while these increases were 11 percent and 25 percent, respectively, in comparison adults.

Costs increased more in each chronic disease population than in its comparison

population, if measured in terms of real dollars rather than percentages. Whether it is appropriate to compare cost trends in terms of real dollars or percentages or a mixture depends upon the drivers of costs. When costs are driven up by wages rising faster than overall inflation, then costs may be expected to rise by similar percentages among adults with and without a particular disease. When costs are driven up by new treatments unrelated to the targeted disease, then costs may be expected to rise by similar amounts of real dollars. While various comparisons yield useful information, no comparison should simply be assumed to show us what would have happened to chronic disease costs in the absence of DM.

The DM business case predicted savings mainly from reductions in hospital days. This did not happen, despite increased use of effective medications and improved risk-factor control. Perhaps reductions in hospital use will occur in the next several years, or perhaps such reductions are offset when better-managed patients become more willing and able candidates for elective procedures or survive longer as high users of services.

■ **Would DM have achieved cost savings if the programs were designed differently?** DM programs differ in design, scope, scale, and operational detail as well as in the talents of leaders and staff, so we cannot broadly generalize from the TPMG experience. But this experience is worth considering. The DM programs are consistent with Ed Wagner's Chronic Care Model, the recommendations of an Institute of Medicine (IOM) report, and the definition of DM from the Disease Management Association of America.[9] The health plan's size and information technology facilitate population-based programs. Prepayment and a relatively stable population align incentives for long-term health maintenance. The integrated delivery system gives DM programs easy access to clinicians as well as to patients. Quality improvement has been marked and compares favorably with other health plans in Health Plan Employer Data and Information Set (HEDIS) reports.

To facilitate consideration of how optimal DM programs might save costs, we discuss three causal pathways to savings. Quality improvement: DM can improve health by increasing use of effective medications and improving self-care, thereby preventing enough exacerbations and complications to save money. Utilization management: DM can reduce overuse with a supportive approach that is acceptable to patients. Predictably high-cost patients are given a case manager who coaches self-care and discourages inappropriate use of the ER, facilitates timely discharge from the hospital, prevents duplicative tests, and steers patients to less costly services. Productivity improvment: DM can offload work from doctors to less costly clinicians and deliver care by telephone and the Internet instead of traditional office visits. Although DM typically supplements usual care, it could boost productivity if delivered in ways that substitute for—or reengineer—usual care.

Our evaluation offers several lessons about the quality pathway—the pathway featured in the literature on DM. First, DM programs can contribute to rapid improvement in quality when effective medications are underused. Second, it was

more difficult to reduce obesity or increase exercise than to increase the use of effective, well-tolerated medications. Perhaps it will be easier to reduce obesity once broader social and cultural forces reduce some of the barriers to diet and exercise that impede the efforts of patients and clinicians. Third, opportunities for quality improvement change over time as usual care improves. Some components of DM (such as reminders for patients needing recommended tests) have become part of usual care at TPMG. Statins had been underused but now are likely to be prescribed for CAD even without a dedicated care manager. To sustain a vital role in quality improvement, DM programs need to adapt as some of the shortcomings of usual care are fixed and others become apparent or amenable to DM methods.

If the quality pathway leads to savings, then we should be finding savings, because trends in quality indicators have been very favorable. Perhaps DM programs can save money via the utilization management pathway, especially in settings where services are often uncoordinated, unnecessary, or overpriced. We doubt the validity of reports of big, quick savings from DM; however, if DM has accomplished some quick savings, it is more plausible that it was done by utilization management rather than by making a chronic disease population healthier. There may be less need for TPMG to use DM as a utlization management tool because TPMG has limited overuse in other ways. Prepayment and the culture of Kaiser Permanente have kept hospital use rates below those of California and the United States.[10]

DM programs can pursue both the quality and utilization pathways. On both, targeting is crucial—focusing costly care managers where they can do the most good. For quality, the optimal target is patients who underuse effective treatments; for utilization management, it is patients who overuse costly services. However, we found that patients who don't get recommended medications differ from those who are predictably high cost.[11] Targeting for savings may not be optimal for quality improvement (and vice versa). Underuse and overuse both need to be addressed, but not necessarily in the same patients and with the same interventions.

A third pathway from DM to savings is to boost productivity. Whereas quality improvement aims to reduce the need for services (by improving health) and utilization management aims to reduce the use of services that are not needed, productivity improvement reduces the costs per unit of services (or health) delivered. The evaluation of productivity is beyond the scope of this paper, yet it is worth noting this potential pathway to savings.

■ **What's wrong with the business case that DM can save money by improving quality?** When DM programs remedy underuse of effective treatments, DM cannot be cost-saving unless the recommended treatments are. Most of the treatments recommended for the targeted conditions are cost-effective but not cost-saving.[12] They increase the length and quality of life at a cost that is reasonable—a good value compared with other services—but higher than the savings that accrue when exacerbations and complications are prevented.

Purchasers who hope nonetheless that DM can eventually achieve savings by improving health should ask: How much of the savings would be available for uses beyond health care? Maybe very little. Cross-national spending studies do not suggest that a population's health drives per capita medical spending.[13] This is overlooked when it is assumed that because sick people tend to be costly, it follows that the prevention of sickness would help control rising costs. Nationwide spending on medical services may be driven up by complex forces—medical technology, growth in per capita gross domestic product, cultural forces shaping consumer demand, political and economic forces shaping government policy, the health insurance market, and the supply of medical professionals and hospital beds—and then sickness affects who gets more or less of the medical services available.

In theory, health improvement gives an entire nation the potential to reduce health care spending and use the savings elsewhere in the economy. But in the real world, we do not find times and places where this theoretical potential matters much. If the other drivers of nationwide health spending are "held constant," why doesn't health improvement reduce spending? Perhaps because the other drivers cannot be held constant: When technological advances improve health, they make more improvement feasible, and so the savings are spent on additional health services. Perhaps health improvement tends to make health more valued.

■ **Study limitations.** A limitation of this study is the unavailability of comparison groups comprising similar chronic disease patients whose care was not influenced by DM. We expect that much will be learned from the randomized trial of DM programs that Medicare plans to conduct in fee-for-service settings.[14] Another limitation is the unavailability of data on patients' functional status and work productivity, which may improve with DM. However, a strength of our study is that we examined use and total costs for seven years for four chronic conditions, including all patients with the conditions in a large population.

We should try to reduce costs as we try to improve quality. But we cannot reduce costs by improving quality unless the treatments and educational interventions that we bring to the chronically ill are not merely recommended by evidence-based guidelines but are cost-saving. Nevertheless, the rationale for DM programs—like the rationale for any medical treatments—should rest on their effectiveness and value regardless of whether they save money. DM programs should be championed when they improve health at a reasonable cost.

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NOTES

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6. The five classes were diuretics, ACE inhibitors or ARBs, beta-blockers, calcium-channel blockers, and other (vasodilators, alpha blockers, and alpha agonists).
7. We used the overall CPI as the deflator because the purpose of the deflator is only to adjust for the declining value of the dollar. Other factors that affect the costs of health care for patients with the conditions are addressed with the comparison groups and in discussion. For reasons why use of the medical component of the CPI would be problematic, see Harvard Center for Risk Analysis, "Cost-Utility Analyses Published from 1976 to 2001, with Ratios Converted to 2002 U.S. Dollars," April 2004, www.hsph.harvard.edu/cearegistry/1976-2001_CEratios_comprehensive_4-7-2004.pdf, p. 88 (27 July 2004).
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11. In the CAD population, for example, the 25 percent whose LDL or BP are undertreated and poorly controlled are less likely than the remaining 75 percent of CAD patients to have predicted costs (as indicated by the prospective DxCG relative risk score) in the highest quartile of CAD patients. Also, the 3 percent whose LDL and BP are undertreated and poorly controlled are less likely than the remaining 97 percent to have predicted costs in the highest 3 percent of CAD patients. Thus, if available resources permit us to target either the "riskiest" 25 percent or 3 percent, a high-risk target defined by poor risk-factor control overlaps less than would be expected by chance alone with a high-risk target defined by predicted cost.
12. See, for example, M. Johannesson et al., "Cost Effectiveness of Simvastatin Treatment to Lower Cholesterol Levels in Patients with Coronary Heart Disease: Scandinavian Simvastatin Survival Study Group," *New England Journal of Medicine* 336, no. 5 (1997): 332–336; CDC Diabetes Cost-Effectiveness Group, "Cost-Effectiveness of Intensive Glycemic Control, Intensified Hypertension Control, and Serum Cholesterol Level Reduction for Type 2 Diabetes," *Journal of the American Medical Association* 287, no. 19 (2002): 2542–2551; and M.P. Rutten-van Molken et al., "Costs and Effects of Inhaled Corticosteroids and Bronchodilators in Asthma and Chronic Obstructive Pulmonary Disease," *American Journal of Respiratory and Critical Care Medicine* 151, no. 4 (1995): 975–982.
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