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## The Business Case for Diabetes Disease Management for Managed Care Organizations

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# The Business Case for Diabetes Disease Management for Managed Care Organizations\*

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## Abstract

Diabetes is a common and very costly chronic disease. There is broad-based agreement on how to manage diabetes, yet less than 40% of adults with diabetes achieve guideline-recommended levels of medical care. We investigate the reasons for this phenomenon by examining the business case for improved diabetes care from the perspective of a single health plan (HealthPartners of Minnesota). The potential benefits accruing to a health plan from diabetes disease management include medical care cost savings and higher premiums. The potential costs to the health plan derive from disease management program costs and adverse selection. We find that the implementation of diabetes disease management coincided with large health improvements. For a defined population of diabetes patients, medical care cost savings over several years were small in the closed panel medical group but moderate for the health plan overall. We find evidence that adverse selection and the timing of cost and benefits worsen the health plan business case. In addition, the payment systems, from purchaser to health plan and health plan to provider, are very weakly connected to the quality of diabetes care, further weakening the business case. Finally, overlapping provider networks create a public goods externality that limits the health plan's ability to privately capture the benefits from its investments. Nonetheless, it is clear that improved diabetes care affords economic benefits to health plans as well as valuable quality of life benefits to adults with diabetes.

**KEYWORDS:** diabetes, disease management, HMO

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\*The impetus for this research was a case study conducted as part of a larger project on the Business Case for Quality funded by the Commonwealth Fund and led by researchers at the Institute for Healthcare Improvement. Two organizations served as case study sites for the business case for diabetes disease management: Independent Health (Buffalo, NY) and HealthPartners (Minneapolis, MN). Copies of these original case studies can be obtained from the website of the Commonwealth Fund ([www.tcf.org](http://www.tcf.org)). This paper extends the case study research at HealthPartners and explores several of the policy and management issues that surfaced during the research and writing of the original case studies.

## OVERVIEW AND SUMMARY

Diabetes is one of the most common and costly of all chronic diseases. According to the Centers for Disease Control and Prevention, 14.5 million Americans have been diagnosed with diabetes, and an additional 6.2 million are believed to have undiagnosed diabetes. Diabetes is the sixth leading cause of death in the United States and is a major risk factor for other diseases such as cardiovascular disease, stroke, blindness, and end-stage renal failure. In 2002, the costs of treating diabetes and its sequelae amounted to \$92 billion; indirect costs deriving from disability, lost work days, and premature deaths were estimated at an additional \$40 billion.<sup>1</sup>

In comparison to other chronic diseases, diabetes is relatively well understood and there is broad-based agreement in the medical profession about how to manage the disease. Despite this professional knowledge and consensus, diabetes is often poorly managed in practice. For example, it is estimated that less than 40% of diabetics receive guideline levels of medical care in 1999.<sup>2</sup> In an effort to better understand the reasons for the disappointing performance of the health care system with respect to diabetes, we conducted an in-depth case study of the diabetes disease management (DDM) program at HealthPartners, an integrated health system based in Minneapolis, Minnesota. In particular, we examine the business case for diabetes management from the health plan's perspective, and pose the questions: on a financial basis, is DDM a good investment? What factors significantly impact this determination?

Based on analyses of operating costs and estimated benefits, we find that the net return to HealthPartners of DDM is positive in each of the 10 years of the study period and that these net savings are modest at the beginning but grow steadily over the time period. Because we were unable to account for the fixed costs of establishing the information systems on which the DDM program critically depends, our analyses may slightly overstate the net benefits to the health plan. Even so, in comparison to the societal benefits, the private net benefits to the health plan are quite modest. This finding suggests that DDM will be underprovided by health plans in a free market.

We go on to identify some of the factors that contribute to this underprovision and offer some potential remedies. We focus on four particular areas. The first is adverse selection: more diabetics enroll in plans that have good diabetes care. Since even well managed diabetics cost more than non-diabetics (without risk adjusted payments), adverse selection results in losses for health plans. The second factor is plan turnover. Within an existing pool of people,

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1 These estimated costs for diabetes in 2002 were reported on the website of the American Diabetes Association ([www.ada.org](http://www.ada.org)).

2 CDC analysis of data from the 1997-1999 Behavioral Risk Factor Surveillance System (BRFSS).

diabetes management costs money in the short term, while saving money down the road. Because people change health plans frequently, some of the long-term savings from good care management are not realized. The third issue is contracting difficulties. Since diabetics benefit enormously from good disease management, the obvious way to pay for such programs is through additional insurance charges. But the complicated system of health plan payments – through employers, and then on to employees in the form of lower wages, makes this financing system difficult. As a result, investment decisions are based on monetary savings alone, not including health benefits. The final issue we discuss is network externalities. When physicians contract with multiple insurers, there are spillovers in quality initiatives. A plan that pays for high quality will benefit its competitors as well. As a result, the incentives for a plan to invest in quality improvement are significantly limited. In all of these cases, the flow of money does not match what would be optimal socially. We discuss ways that the money flow can be reallocated to support better care management.

We conclude with a discussion of whether the lessons learned from this business case for diabetes may be applicable to other chronic diseases.

## **DIABETES – THE DISEASE AND TREATMENTS**

### **Description of the disease and health consequences**

Diabetes is a disease in which the body fails to produce or properly use insulin and therefore cannot efficiently use glucose as an energy source. There are two major types of diabetes. Type 1 diabetes, a disease in which the body does not produce any insulin, occurs most frequently in children and young adults. It accounts for 5 to 10% of diabetes. Type 2 diabetes is a metabolic disorder resulting from the body's inability to make enough or properly use insulin. Its cause is unknown, although both genetics and environmental factors such as obesity and lack of exercise predispose individuals to the disease. Type 2 diabetes accounts for 90-95% of all cases of diabetes and is rising rapidly as the population becomes older and the prevalence of obesity increases. The American Diabetes Association (ADA) reported total diabetes prevalence (diagnosed and undiagnosed) to be 7% of the population (~20.8 million people); the prevalence in the adult population (20 years or older) is estimated at 9.6%.

Diabetes is the leading cause of blindness in people aged 20-74 (between 12,000 and 24,000 cases of blindness annually due to diabetes, according to the ADA) and the leading cause of end-stage renal disease, accounting for around 44% of new cases in 2002; in the same year, nearly 154,000 people with end-stage renal disease due to diabetes were undergoing chronic dialysis or had a kidney transplant. In addition, about 60-70 percent of people with diabetes have

mild to severe forms of diabetic nerve damage; in severe cases this can lead to lower limb amputations. In 2002, roughly 82,000 amputations were performed on people with diabetes. People with diabetes are 2 to 4 times more likely to have heart disease or suffer a stroke than individuals without diabetes. Heart disease and stroke account for 65 percent of deaths in people with diabetes. Finally, adults with diabetes are about twice as likely to die as non-diabetics adults of similar age.<sup>3</sup>

### **Treatment programs**

In most cases diabetes care is coordinated and directed by the patient's primary care physician (PCP). Typically, the PCP will see those with diabetes 2 to 4 times a year, order tests and examinations at recommended intervals, and ideally will counsel the patient on diet and exercise regimens that will delay the onset of more severe disease and complications. The majority of those with diabetes are prescribed oral medication or injections of insulin to control glucose levels,<sup>4</sup> as well as medications as needed to control cholesterol and blood pressure levels. Ideally, the patient self-monitors his or her blood glucose level on a daily basis and contacts the PCP if changes occur. The care provided by the PCP is not typically integrated with that provided by specialists such as endocrinologists or podiatrists. The PCP simply refers the patient to these specialists and/or admits him or her to the hospital when necessary.

### **Quality of Diabetes Care**

The set of measures commonly used to assess quality of care for diabetics was designed by the Centers for Medicare and Medicaid Services and the National Committee on Quality Assurance (NCQA). These measures were incorporated into NCQA's Health Plan Employer Data and Information Set (HEDIS) in 2000.<sup>5</sup> **Exhibit 1** displays year 2000 HEDIS data for health plans voluntarily submitting data to NCQA; for each diabetes performance measure, the graph displays the scores of the median health plan and the health plans in the 10<sup>th</sup> and the 90<sup>th</sup> percentiles. Note that health plan performance on screening measures (HbA1c testing, blood pressure testing, and cholesterol testing) is substantially higher than

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<sup>3</sup> These statistics were taken from the website of the American Diabetes Association, [www.diabetes.org/diabetes-statistics/complications.jsp](http://www.diabetes.org/diabetes-statistics/complications.jsp)

<sup>4</sup> At HealthPartners, only about 30% of patients with diabetes take insulin.

<sup>5</sup> The six measures are the percentage of the diabetic population with: 1) HbA1c tested in the last year; 2) poor HbA1c control (HbA1c > 9.5%); 3) eye exam performed in the last year; 4) lipid profile performed in the last year; 5) lipids controlled (LDL-C < 130 mg/dL); and 5) monitoring for diabetic nephropathy (kidney disease) at least once in the past year.

plan performance on the corresponding measures of disease control (HbA1c control, blood pressure control, and cholesterol control). This is true even though the HEDIS measures set fairly low thresholds for diabetes control. For example, the HEDIS definition of HbA1c control is “HbA1c level below 9.5%”; the ADA target is 8%. The goal at HealthPartners is to test HbA1c levels every 3-6 months and to keep HbA1c levels under 7%. If judged by these measures, most health plans are not providing guideline-recommended screening rates for most diabetic patients and the vast majority of plans are not successfully controlling the disease in their member population.

Even these performance data are probably overestimates of the true rates of screening and control in the U.S. population since they are based on a select sample of health plans that have the capability to collect these data and that choose to voluntarily report the data to NCQA. Data included in the 2005 National Healthcare Quality Report indicate that in a national sample of adults with diabetes, about 90% had an HbA1c test in a one year period of time, but only 39.8% had HbA1c levels < 7%.<sup>6</sup>

### **Disease Management Programs**

In the last decade, following the pioneering work of Edward Wagner at Group Health of Puget Sound, a new model emerged for the delivery of chronic care.<sup>7</sup> The chronic care model prescribes a set of activities that emphasize active monitoring of disease in a panel of patients, care delivery according to clinical guidelines, education of patients about their disease and self-care techniques, and proactive patient outreach to assist patients in managing their disease. These activities are often collectively referred to as disease management.

Impetus for disease management stemmed in part from the poor match between the existing health care delivery system designed for acute care and the health care needs of the chronically ill. First, the chronic care patient cannot be “cured” and thus requires ongoing medical care and attention; strict adherence to guideline-recommended care slows progression of the disease. Second, the effective management of chronic disease cannot be accomplished solely by the skilled practice of a single clinician; at a minimum, the patient must be engaged and actively involved. Very often, chronic disease management will require coordination among multiple clinicians and educators with various expertise, working in separate settings, and often responding to different incentive systems.<sup>8</sup>

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<sup>6</sup> HHS: Agency for Healthcare Research and Quality, Rockville, MD, December 2005. AHRQ Publication No. 06-0018.

<sup>7</sup> See Wagner, E., B. Austin, and M. Von Korff, 1996a and 1996b, and Wagner, et al 2001a

<sup>8</sup> According to Ed Wagner, “Successful chronic disease interventions usually involve a coordinated multidisciplinary care team.” See Wagner, E.H. (2001)

Patient registries, databases containing information on all patients with a particular chronic disease, are often the key starting point for successful disease management. Other program elements include patient and clinician reminders for recommended tests, patient education services, interventions to provide ongoing encouragement and support to patients, interventions and resources to support physicians, and a comprehensive monitoring and feedback system. Health plans implementing disease management programs may also include benchmarking and a structured process to facilitate experimentation and learning.

Disease management programs are frequently coordinated at the health plan level rather than at the physician level, largely because the plan is in the best position to pull together all the information needed to track the patient's health status (from laboratories, specialists, PCPs, and pharmacies). There are also likely to be scale economies in the creation of information systems required to collect and benchmark the various clinical and cost data. And because health plans often receive a fixed per member payment (premium) from a payer and thus bear the financial risk of medical care utilization, the health plan may have the most clear financial incentives to keep diabetic patients healthy.

In recent years, independent providers of disease management programs have entered many health care markets and have provided health plans with the option to outsource the systems and support for DM services. These vendors create identification and outreach services, and provide direct-to-member support – including education and care reminders. A subset of these DM vendors will also coordinate and integrate services with the health plan's care delivery system. At least 48 disease management companies were active in the United States in 2005<sup>9</sup>. The effectiveness of vendor-delivered diabetes disease management is under investigation. Published reports such as Knight et al., 2005, show mixed impact on quality of care. CMS is now conducting a \$400 million dollar demonstration program to ascertain the impact of vendor-delivered disease management on the cost and quality of diabetes and heart disease care, with results expected in 2008.

The diabetes disease management model evaluated in this report was not delivered by vendors, but was designed and delivered internally by HealthPartners and by HealthPartners Medical Group. This "integrated disease management" model is described below. Potential advantages of this model include complete access to clinical and administrative data, direct access of disease managers to treating physicians, and lower per member per month operating costs than are typical of vendor-delivered plans.

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<sup>9</sup> See the website of the Disease Management Association, [www.dmaa.org](http://www.dmaa.org), for details.

## **Review of cost-effectiveness literature**

Two large clinical trials provide evidence that strict HbA1c control leads to reductions in short term and some long term complications. The Diabetes Control and Complications Trial (1993), which tracked Type 1 diabetic patients over 6.5 years, produced evidence that intensive insulin therapy reduced blood glucose levels and effectively delayed the onset and slowed the progression of complications. A recently published long-term follow-up of the DCCT patients (Nathan et al., 2005) showed major reductions in major cardiovascular events over a 16-year period of time. In a large clinical trial of adults with type 2 diabetes, the UK Prospective Diabetes Study Group (1998) documented reduced eye, kidney, and heart complications in those with improved glucose and blood pressure control. The findings of these two trials substantially influenced both the content of current guidelines for diabetes care and the design of diabetes disease management programs.

When evaluating the relationship between diabetes disease management and improved health and cost outcomes, it is useful to consider three separate links : 1) enhanced disease monitoring (e.g. regular HbA1c testing, LDL testing, foot exams, retinal exams); 2) improved physiological outcomes (i.e. HbA1c levels, LDL levels, and blood pressure levels); and 3) improved health outcomes (e.g. reduced incidence of complications and premature death) and reduced medical care utilization (e.g. reduction in diabetes-related hospital admissions). A number of research studies have examined subsets of these links, but typically in clinical trials whose interpretation is limited by selection effects.

There is a considerable literature suggesting that diabetes disease management programs can be effective at improving monitoring and physiological outcomes over the short to medium time frame (i.e. 1-3 years). For example, several papers provide evidence that diabetes management programs lead to increased rates of disease monitoring and (in some studies) to reductions in HbA1c and lipid levels (Aubert et al 1988; Sadur et al., 1999; Sidorov et al 2000; Sperl-Hillen, J. et al., 2000; Trento et al 2001; Wagner, et al 2001a; Sidorov et al., 2002; Sperl-Hillen & O'Connor, 2005). In some cases, short term improvements in physiological outcomes (A1c levels) were associated with reduced utilization but most of these studies were not controlled, so that selection effects and regression to the mean may have accounted for the observed associations (Sadur et al., 1999; Wagner, et al 2001a; Sidorov et al, 2002)

Other studies examine cross-sectional differences in rates of complication and medical care utilization for patient groups with different HbA1c levels. These studies find lower rates of complication and lower utilization among diabetics with lower HbA1c levels (Gilmer et al., 1997; Gaster and Hirsch, 1998; Sadur et al., 1999; Wagner et al, 2001b; Sidorov et al., 2002; Gilmer et al., 2005).

However, Wagner et al. (2001a) find no significant relationship between improvement in A1c levels and decreased utilization except in small subgroups of patients with high baseline HbA1c levels.

Relatively few studies have examined all the linkages from a disease management intervention through to reduced utilization and medical care cost savings. Five studies (Rubin et al., 1998; Sadur et al., 1999; Steffens 2000; Sidorov et al., 2002; Wagner et al., 2001a) report that intensive DM was associated with decreased hospital admissions and inpatient days in the one or two years following the intervention; three of these studies also reported lower total medical care costs (Rubin et al., 1998; Steffens 2000; Sidorov et al., 2002). However, two of these studies did not find significant improvement in A1c levels (Rubin et al., 1998; Wagner et al 2001a), and in the uncontrolled data presented in the Rubin study, the results could be accounted for by regression to the mean.

A recent study by Fireman and colleagues (2004) presents the longest evaluation of the utilization and cost consequences of diabetes disease management reported in the literature. The authors examine testing rates, physiological outcomes, utilization, and medical care costs over a six year time period for Kaiser patients with four different chronic diseases (asthma, coronary artery disease, diabetes, and heart failure). For diabetic patients, disease management was associated with increased testing rates (A1c and LDL); improved physiological outcomes (lowered LDL levels); and increased use of guideline-recommended medications. Data on changes in mean A1c levels were not reported. In the utilization and cost analyses, the experiences of diabetic patients were compared to the experiences of patients without diabetes over the same time period.<sup>10</sup> In terms of percentage changes, utilization among diabetics compares favorably to utilization among non-diabetics – diabetic patients experienced larger percentage decreases (physician visits, ER visits, inpatient admissions) or smaller percentage increases (inpatient days) in utilization relative to the comparison group. The notable exception to this pattern was in the category of non-physician clinic visits where diabetic utilization increased faster than non-diabetic utilization. Annual costs for those with diabetes rose 12% over the six year study period while annual costs for non-diabetics rose 25%; however in dollar terms, average annual costs of those with diabetes increased by 25% more (\$837) than annual costs of non-diabetics (\$663). The authors note that as prevalence and diagnosis rates for diabetes increased over the time period, the average health improvements and utilization decreases may have been due to decreases in the average illness severity over time.

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<sup>10</sup> The comparison group included patients with chronic diseases other than diabetes.

## **THE SETTING WE ANALYZE: DIABETES MANAGEMENT AT HEALTHPARTNERS**

There are several ways one might understand the economics of disease management. A common economic approach is to estimate regression models relating plan performance to the presence of disease management programs. Because these programs are not uniform, however, such regressions are difficult to interpret. Further, cost differences due to disease management will likely be swamped by differences in the health status of plan enrollees. A second path, which we follow here, is to consider a case study. Focusing on a particular health plan that implemented disease management allows us to track the costs and benefits of that program. The ideal case study includes a ‘treatment plan’ (a plan that implemented disease management), and a ‘control plan’ (one that did not). For data reasons, we only have information on a treatment plan: HealthPartners of Minneapolis, MN. We thus consider trends in that plan only (comparing them somewhat with broader trends in the region). The limitation to a single plan limits how precise we can be in our results. Because the changes that we consider are very large, however, we are reasonably confident of our results. Still, we note in the text where we are more and less certain about our findings.

### **HealthPartners**

HealthPartners is an independent, not-for-profit, integrated health system. In 2005, approximately 30 percent of HealthPartners’ total enrollment (675,000) was served by clinics owned by HealthPartners: (HealthPartners Medical Group, North Suburban Family Practice, and RiverWay Clinics), while the remaining 70 percent were treated by contracted medical clinics. HealthPartners offers a full-range of health insurance products. The health plan is governed by a consumer-elected board of directors.

The HealthPartners network includes approximately 3,700 primary care physicians and 4,500 specialists organized into medical groups. The implementation of an organized disease management approach is aided by the fact that several of the larger medical groups include hospitals and represent integrated systems of care. Medical groups are the units in HealthPartners’ performance measurement system. Since 1993, HealthPartners has collected performance data at the medical group level and published them on the HealthPartners’ website to facilitate member choice of medical group. The data are also fed back to individual medical groups to support learning and quality improvement (Bohmer and Beaulieu, 1999). In the 1990’s, HealthPartners reimbursed medical groups primarily through capitation; medical groups were at risk for specialist fees, hospital admissions and pharmacy charges. Several years ago, HealthPartners

changed its reimbursement policy and now bears roughly 70% of the risk for medical and pharmacy costs. The health plan withholds a portion of providers' total reimbursement payments, and conditions payment of the withheld amounts on providers' satisfactory performance on measures of care and service quality.

### **Minneapolis Market**

For several decades in Minnesota, physicians have practiced in groups and worked in clinics. Indigenous group practice has affected the manner in which the market has evolved. In particular, this organization facilitated the early introduction of capitated reimbursement systems; it also facilitated the formation of the care systems and medical groups owned or contracted by HealthPartners. The provider market in Minneapolis is also characterized by substantial network overlap; most medical groups contract with all the major health insurers, although one exception to this is HealthPartners' tightly integrated HealthPartners Medical Group – HPMG.

In 1992, shortly following the merger that created HealthPartners, the Institute for Clinical Systems Improvement (ICSI) was formed with funding from HealthPartners. ICSI is a physician directed organization that plays a key role in generating widely accepted clinical practice guidelines, helping physicians implement these guidelines in their medical groups, and facilitating collaboration on processes to improve the quality of care for the entire community. ICSI has since become a community asset funded by all of the major insurers in MN.

### **Diabetes Disease Management Programs**

The diabetes management program at HealthPartners was initiated in 1992 when ICSI introduced a renewed focus on quality; individual components of the integrated program have been phased in over a decade. The core components of the diabetes management program are fairly typical: education and counseling to help patients manage their disease; guidance to primary care physicians (PCPs) to help them support patients in this process; comprehensive monitoring to keep track of patient progress and feedback performance data to providers; and performance based financial rewards and recognition for clinicians.

Patient education is provided directly by PCPs, by Certified Diabetes Educators (CDEs) and other nurse-educators, through patient mailings and a telephone call-in line. ICSI Diabetes Guidelines, which were first approved in December 1995 and have been updated annually since, are distributed to all participating medical groups. They identify outcome targets for diabetic patients (e.g. HbA1c < 8% initially) and back up treatment recommendations by citing available evidence on effectiveness from the academic literature. The guideline

recommendations are specific when supported by evidence (e.g. use of specific classes of medications), but leave flexibility to individual medical groups where compelling evidence does not exist.

Patient monitoring is the third key component of the program. HealthPartners compiles at-risk lists to assist medical groups in meeting the outcome targets specified in the guidelines. The lists are compiled 2-4 times a year and made available on-line to medical groups; they include the names of patients with diabetes, other diseases the patients might have, the dates of recent HbA1c tests, LDL tests, and indicators for whether other recommended or required exams are due (e.g. diabetic retinal exam). For HPMG only, the lists include the test results as well as the dates of the most recent HbA1c and LDL tests.

Along with the at-risk lists, HPMG sends to each individual physician a diabetes performance profile. This profile contains data on the testing rates and average test results for patients in the physician's panel compared to the average in the clinic and in the medical group. Data on relative performance reportedly inspires competition between physicians and clinics. HealthPartners also disseminates a Clinical Indicators Report (CIR) to all primary care medical groups, showing comparative data on test rates and on HbA1c and LDL levels based on random chart audits.<sup>11</sup> This information is also shared with the public on HealthPartners website.

In HPMG, the at-risk lists lead to proactive contact with patients. Diabetic Resource Nurses (DRNs) work from these lists to reach out to patients and provide training and education. DRNs may also work with the PCP to select patients with whom they would work in a more intensive case management framework.<sup>12</sup>

Diabetes disease management is less formal in the contracted medical groups, and the intensity varies among medical groups and clinics. The at-risk lists received by the contracted medical groups are less detailed than those for HPMG physicians (test results are not available) and do not cover all of the physicians' patients (only those insured by HealthPartners). Around one third of the clinics use the at-risk lists as tools for proactive contact with patients; some clinics use it to check details in their own internal registries; and others do not use it at all, preferring to pull data from their own systems. In addition, HPMG recommends use of a diabetes management algorithm that guides the use of different therapies; but not all physicians use this algorithm.

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<sup>11</sup> For the contracted clinics the test data are obtained by sampling individual medical records.

<sup>12</sup> The DRN program is now being replaced with the Certified Diabetes Educator (CDE) program; 5.9 CDE FTEs will be available across HPMG. The CDE program will provide fewer nurses who are more highly trained to deliver education and care specifically to diabetics.

In addition to patient education, ICSI guidelines, and at-risk lists, HealthPartners uses a medical group bonus program to encourage physicians to focus on diabetes management. The Outcomes Recognition Program pays a potential bonus of between \$75,000 and \$250,000 (< 0.5% of premiums) to medical groups that achieve “stretch” targets in 5 areas including diabetes management. The total potential payment is roughly \$500,000 annually.<sup>13</sup> Because the aim of the program is to reward stretch performance rather than average performance, the targets change as the overall performance of the medical groups improves. Medical groups have commented that the bonus payments from the Outcomes Recognition Program (ORP) are not large enough to provide significant extra margin to the medical group, but that they provide support to pay for administrative costs of the quality efforts. An annual award and recognition dinner for the winners of ORP is well attended by award recipients, the leadership group at HealthPartners, and community leaders.

HealthPartners also created a public forum and culture of improvement through its Partners for Better Health program, which has now evolved into the Health Goals 2010 program. Every 5 years, HealthPartners sets aggressive 5-year goals for performance across a number of areas intended to improve health. Previous goals have entailed improving care for people with heart disease, improving use of preventive health care services, and improving the activity and diet of members. Goals relating to improved diabetes care have been part of this program since its inception in 1995.

### **Diabetes Prevention**

The Health Behavior Group (HBG) at HealthPartners provides services to medical groups to identify and care for those members who are at risk for developing diabetes. Identification of at-risk members comes in part from their completion of a voluntary Health Risk Assessment (HRA). Those members judged to be at risk for developing diabetes receive a phone call from a staff member at HBG to discuss how to manage their risk. They are also referred to formal programs within HBG designed to support lifestyle modification.

### **Results – Health Impact**

At the current time, diabetes is not a curable disease; the best that diabetic patients and health care providers can do is to slow the progression of the disease and to limit damage from complications. With this in mind, we considered three

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<sup>13</sup> 30% of the bonus is awarded based on patient satisfaction; the rest is divided equally (17.5% each) between the 4 quality indicators, one of which is related to diabetes care. The data are gathered through random chart audits.

measures of the impact of diabetes disease management on the health of those with diabetes. In diabetes, blood levels of glycated hemoglobin (HbA1c) and low density lipoprotein (LDL) have been shown to be good predictors of ongoing and future damage to the body. Thus, the monitoring and control of these proximate health outcomes are good measures of the impact of diabetes disease management. We examine the proportion of diabetics who have regular HbA1c and LDL tests as a measure of disease monitoring. We examine the proportion of diabetics whose HbA1c and LDL levels meet guideline thresholds as a measure of disease control. Over time, as monitoring and control of HbA1c and LDL improve, we expect that adverse health outcomes attributable to diabetes (e.g. retinopathy, renal disease, amputations, and heart disease) would be delayed or prevented. Thus, a final measure of the health impact of diabetes disease management is the incidence rate of these serious and costly adverse health outcomes.

HealthPartners has tracked these performance measures over time in three diabetes populations. The first population is the 1994 cohort of continuously enrolled diabetes patients receiving care from providers in HPMG (the closed panel medical group owned by HealthPartners). In 1994, there were 6292 diabetes patients in this cohort; by the year 2000, attrition had reduced this cohort to 3535 patients. The second population tracked by HealthPartners is the repeated cross-section (1994-2000) of all diabetes patients in HealthPartners Medical Group. The third is the repeated cross-section (1994-2004) of all adults with diabetes in HealthPartners. Both cross-section populations include the 1994 HPMG cohort (see **Exhibit 2** for the size of these populations over time). Comparing the health impact in the 1994 HPMG cohort with the health impact in the cross-sectional diabetes population should provide some indication of whether the magnitude of the health impact varies with length of time enrolled in disease management.

Exhibits 3 through 6 describe the impact of the diabetes management program on patient health over time.<sup>14</sup> As shown in **Exhibit 3**, diabetes management appears to have had little effect on the rate at which diabetics monitored their blood sugar levels, either in the HPMG cross-section or the HPMG cohort, perhaps because baseline monitoring rates were reasonably high. In contrast, the monitoring of LDL levels improved substantially over the time period, though it is difficult to attribute this improvement in LDL testing solely to diabetes management. The LDL level is also an important management target for heart disease and HealthPartners operated a separate heart disease management program over this time period.

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<sup>14</sup> Unfortunately some years of data are missing for some populations. We include all data that could be accessed for the ten-year period of interest.

**Exhibit 4** indicates that mean HbA1c levels and LDL levels improved steadily over the study period. Moreover, the share of diabetes patients with HbA1c levels below 8% (the contemporaneous definition of control) and LDL levels below 130 mg/dl increased substantially over time (**Exhibit 5**). The average HbA1c level fell slightly more quickly in the HPMG cross section compared to the HPMG cohort; this pattern is consistent with the fact that shorter disease duration is typically associated with lower HbA1c levels (O'Connor et al., 2005). The steady improvement in HbA1c over a multiyear period of time in the cohort is essentially unprecedented and contrasts favorably with the experience of the UKPDS study, wherein HbA1c worsened at a rate of 0.1% per year over a 10-year cohort observation period.

In addition, the possibility of adverse retention must be considered in interpreting these cohort data. Investigators at HPMG have previously demonstrated that HbA1c level was not a significant predictor of either death or disenrollment from HPMG over a 4-year period of time (Gilmer et al., 1997). These data and observations suggest that while adverse selection cannot be discounted, its impact would be to make our estimates of benefits related to diabetes disease management conservative.

Our final measures of health impact are the incidence rates of adverse health outcomes. **Exhibit 6** displays the incidence of three adverse health events associated with diabetes in the cross-sectional diabetic population. All three measures have trended down over time. The decrease in myocardial infarction rates is particularly noteworthy because a more sensitive blood test to diagnose myocardial infarction (troponin levels) was introduced and widely used in emergency departments and inpatient settings starting around 1997.

While we recognize that it is not possible to identify a causal relationship between the diabetes management program and these health improvements, our field research suggested a few aspects of the program that were particularly important. One key mechanism proffered was the involvement of ICSI: physicians got together to agree on the desired outcomes, then individual medical groups were encouraged to find ways to reach those outcomes. A second reason for the program's apparent success was that the outcomes measures chosen were clear, could be measured in a credible way (so that there was no dispute over the Outcomes Recognition Program winners, for example), and were backed by rigorous scientific and academic research. Finally, physician performance reports played a critical role in promoting professional competition between physicians, and between clinics, to achieve better outcomes and thereby contributed to benchmarking and learning.

## **Results – Economic Impact**

Conceptually, HealthPartners diabetes disease management program could directly impact both the plan's revenues and costs. In practice, however, there is no revenue impact of the program because of the lack of performance-based payments. There are two avenues through which disease management may directly affect the health plan's costs. First, significant health plan resources were required to implement and staff the diabetes management program including resources to: conduct chart reviews; prepare the at-risk lists; operate the Outcomes Recognition Program; put together educational and wallet card mailings; staff the telephone banks; and provide flow sheets to use in charts. The DDM program costs we estimate for our analyses of the business case do not include up-front investment in information systems.<sup>15</sup> **Exhibit 7** presents the discounted annual and cumulative program cost outlays per diabetic member.

The second avenue through which diabetes management may directly affect health plan costs is a change in the utilization of medical care services by diabetic members. In the short run, the disease management program might increase utilization of certain services delivered in the course of disease monitoring (e.g. additional laboratory tests) and preventive care (e.g. office visits with primary care physicians to review progress and adjust medications, with nurses or health educators to be counseled on nutrition). Over the medium to long term, the expectation is that monitoring and preventive care will lower the incidence of complications and adverse health events thereby reducing inpatient utilization and medical care costs.

Due to the lack of a proper control group, it is not possible for us to determine what the medical care costs of HealthPartners' diabetic patients would have been if HealthPartners had not implemented its disease management program. We estimate these counterfactual costs using the following method. We begin with the average annual medical care costs per non-diabetic member in 1994, the year prior to the implementation of diabetes management at HealthPartners (column 2 of **Exhibit 8**). For each year 1994 to 2004, we compute the percentage growth in average annual medical care costs for adult non-diabetic commercial members (column 3 of **Exhibit 8**). Then, beginning with diabetic costs in 1994, we "gross up" the annual medical care costs for diabetic commercial members by applying the growth rate of medical care costs in the non-diabetic population; this computation yields the predicted annual medical costs for diabetic members in column 4 of **Exhibit 8**. This method requires a critical assumption: absent any intervention, medical care costs would have grown

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<sup>15</sup> HealthPartners had already acquired and implemented much of the technology needed to run the program.

at the same rate in the diabetic and non-diabetic populations at HealthPartners.<sup>16</sup> This would not be true if the costs of treating the sequelae of diabetes grew at rates different from the costs of treating other diseases. Changes in treatment technology, diagnosis capability, clinical guidelines, and disease prevalence could all contribute to differences in cost growth rates.

Column 5 of **Exhibit 8** presents the estimated annual medical care cost savings per diabetic patient (computed using the method described above) at HealthPartners over the time period 1995 to 2004. Annual medical care costs of non-diabetic patients grew at a faster rate than the costs for diabetic patients; these differences imply medical care cost savings for diabetic patients. Note that predicted cost savings are immediate (occur in the first year) and increase substantially over time. The growth in medical care cost savings over time is comprised of cost savings in later years and the compounding of cost savings in early years. The implied annual cost savings by the end of the study period are quite large (\$1900 per diabetic patient), equal to approximately 15% of actual medical care costs for diabetic members.

### **Incentives to Adopt Disease Management at HealthPartners**

Our results concerning the overall economic impact of the program are set out in **Exhibit 9**. In column three, we compute the net economic impact of the disease management program by subtracting the program costs (column 2) from the estimated medical care cost savings (column 1). Column 4 presents the annual discounted net benefit to the health plan from the diabetes program (assuming a 7% discount rate); column 5 presents the discounted cumulative net savings. Over the 10-year time period, we estimate that the diabetes program saves the health plan approximately \$5345 per diabetic patient.

These estimates clearly contain measurement error. In particular, it is difficult to know from the available data whether the net economic effect of the program in its first few years is positive or negative<sup>17</sup>. The longer-term effect is much clearer. Exhibit 10 graphs the predicted and actual cost of treating a diabetic enrollee between 1994 and 2004. By the tenth year of the program the predicted costs savings are likely too large (at approximately \$2000 per enrollee per year) to be explained purely by measurement error.

In percentage terms, the estimated medical care cost savings increased steadily over time until later years when they appear to level off at about 13%. This pattern is consistent with the phasing in of diabetes disease management over

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<sup>16</sup> Recall that the non-diabetic population includes health plan members with other chronic diseases.

<sup>17</sup> The evidence from the HealthPartners cross section implies a small positive effect; that from HPMG suggests a slightly negative effect in years 1-3.

time, with the acquisition of expertise by clinicians in partnering with patients to manage their disease, and with the time pattern of health outcomes among those with diabetes (i.e. the gradual decline in the population's average HbA1c and the increase in the percentage of diabetic members with HbA1c<8%).

We can compare our cost-benefit estimates at HealthPartners to the evidence on cost savings in a number of published articles. Steffens reports 12% cost savings in the first year following the implementation of a diabetes disease management program similar to the one at HealthPartners; however, this level of savings was not achieved at HealthPartners until much later in the study period (year 7) and it is quite large compared to initial medical care cost savings at HealthPartners.

Wagner et al., (2001b) compare the medical care costs of diabetic HMO patients who decrease their A1c level by at least 1% (over a one year period) to the medical care costs of diabetic patients whose change in A1c is less than 0.9%. The authors estimate medical care cost savings of \$400-\$4000 over the next 3 years per patient depending on the initial level of A1c, with higher baseline levels associated with greater cost savings. However, only a small subset of the diabetes population achieved these HbA1c improvements, and cost savings were not reported for the remaining 85% of diabetes patients. Sidorov et al. (2002) compare medical care costs for diabetic patients who participate in a disease management program to medical care costs for diabetics who elect not to participate. The authors estimate that the average medical care costs of DDM participants were approximately 21% lower than costs for non-participants (\$1294 per patient per year). These lower costs were associated with lower inpatient utilization (both admissions and hospital days) and higher primary care utilization (visits). Rubin et al. (1998) find that intensive disease management of diabetics in seven health plans was associated with a total cost decrease of \$44 (10.9%) per diabetic member per month for about 12 months; over the same time period costs for non-diabetics increased by 1.4%. These cost savings were accompanied by decreases in inpatient and outpatient utilization and significant improvement in HbA1c testing, eye exams, foot exams, and cholesterol exams.

Finally, Fireman et al. (2004) examine the utilization and medical care costs of an HMO's diabetic population over the time period during which the HMO was engaged in diabetes disease management (and disease management for other chronic diseases). Over the six year period, 1996-2002, the authors find that average total medical care costs for diabetics increased 12% while average costs for a demographically similar group of non-diabetics increased 25%; in absolute terms however the increase in average costs for diabetics (\$873) exceeded the increases in costs for non-diabetics (\$663). In percentage terms, changes in utilization among adults with diabetes compared favorable to changes in utilization among non-diabetic adults, except in the category of all clinic visits.

These changes in utilization and medical care costs were accompanied by significant improvements in HbA1c and LDL testing rates and average LDL levels.

## **THE COSTS AND BENEFITS OF DIABETES DISEASE MANAGEMENT TO SOCIETY**

The positive estimated business case for diabetes disease management at HealthPartners makes the low level of diabetes care provided in many other settings even more puzzling. Before undertaking a deeper analysis of the potential explanations for this discrepancy, we first examine the costs and benefits of diabetes disease management from society's perspective.

The relevant parties for whom we must assess costs and benefits include health plans, providers, patients and purchasers. In the marketplace, it is very difficult to assess benefits and costs separately for health plans and the providers they contract with or employ to deliver care; the exact division of costs and benefits between these two parties depends on the specific contracting arrangements in place. Similarly, the division of costs and benefits between patients and their employers (purchasers) depends on the specifics of the wage contract and the design of the health insurance benefit. Indeed, as we will explore in detail in this and the next section of the paper, we hypothesize that one of the reasons that diabetes care appears to be underprovided relates to contracting arrangements and institutions in the medical care marketplace that distort incentives.

### **Costs of Diabetes Management**

The only direct costs of diabetes disease management paid by the patient/purchaser will be those that the health plan passes on to them, either through additional premiums or through out-of-pocket costs such as co-payments. From the societal perspective, these payments are simply transfers (e.g. the cost of the co-payment to the patient is offset by the financial benefit of the co-payment to the health plan) and do not entail real resource costs. To the extent that DM programs lead patients to interact with the health care system more frequently (e.g. additional office visits and laboratory tests), patients (and potentially their employers) will incur additional indirect costs both in terms of the costs of travel and the opportunity cost of their time. We have no estimate of these indirect costs.

Plans/providers incur two types of direct costs in implementing a DM program: set-up (fixed) costs and operating (variable) costs. Set-up costs include investment in IT systems, which are needed to create patient registries, track

patient-level health status and service utilization, and generate reports for providers. Staffing costs are also necessary to design and launch the program. Recall that we were unable to account for these set-up costs at HealthPartners. Operating costs are primarily comprised of the human resources necessary to deliver services in a coordinated fashion. These include additional nurses and administrative staff to interact with patients and increased physician time to accommodate increases in patient office visits. Greater use of medication, diagnostic services, and laboratory services will also raise operating costs. At HealthPartners, the average operating cost per diabetic patient per year was approximately \$31; this average cost estimate includes neither the opportunity cost of physician time required to see diabetic patients more frequently in office visits, nor the resource costs of additional medication and laboratory services. These costs will be netted out of the potential benefits of DDM when we compute changes in total medical care costs of treating diabetic patients.

### **Benefits of Diabetes Management**

There are three primary benefits from improved diabetes management: improved quality of life (experienced by the patient), long term cost savings from avoided complications and reduced health care service utilization (experienced by the plan, its providers, and potentially employers)<sup>18</sup>, and workplace productivity gains (experienced by patients and their employers).

To estimate the societal value of disease management programs, we need to value the health improvement of diabetic patients. Eastman et al (1997) use a simulation model of diabetes to estimate the quality of life improvement from improved diabetes care. The authors estimate that a reduction in HbA1c from 10 to 7.2 yields an increase of 0.87 quality adjusted life years (QALYs). If we assume a linear effect of changes in HbA1c on QALYs, and a value of \$100,000 for a year of life (Viscusi 1993), we estimate that the discounted value of an improvement in HbA1c levels consistent with the results we found at HealthPartners is around \$59,000 per patient.<sup>19</sup>

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<sup>18</sup> Note that in a discounted fee-for-service arrangement, reduced long term utilization represent lost work and revenue to providers. Thus, as mentioned earlier, the extend to which providers benefit directly from reduced utilization will depend on the contract between the health plan and its providers.

<sup>19</sup> A 1.9% reduction in HbA1c translates to  $0.87/2.8 * \$100,000 * 1.9 = \$58,900$ . The calculations assume that the benefits are generated immediately and maintained indefinitely (or for long enough to create the extra years of life). The calculation also assumes that the extra years are added to the beginning rather than the end of life. If we assume instead that the HbA1c improvements (and the additional QALYs) occur at the end of the 10 years, and use a 7% discount rate, the discounted value is equal to  $\$59,000/(1.07)^{10} = \$30,000$ .

Proper management of diabetes might actually increase the costs of medical care in the short- to medium-term (e.g. because of increased testing, medications, and clinician visits). Over the longer term, a reduction in the incidence of co-morbidities among diabetic patients will likely lead to lower costs from avoided heart attacks, amputations, cases of end-stage renal failure, and other complications. In the case of HealthPartners, we estimated the discounted medical care cost savings per diabetic patient to be approximately \$5,345 over 10 years.

The existing literature suggests potentially large benefits to employers (particularly self-insured employers) for effective care management of diabetic employees (Testa and Simonson 1998; Ng, Jacobs and Johnson 2001; Ramsey et al 2002). These benefits derive from a number of sources including reduced disability payments, reduced absenteeism, and enhanced productivity. Unfortunately we do not have sufficient data to estimate these potential benefits for HealthPartners patients.

### **Societal Cost-Benefit Analysis**

Quantifying these costs and benefits yields an estimate of the net value that society gains from higher quality care for diabetes (see **Exhibit 11** for a summary). With data from HealthPartners, we estimated that the total discounted net cost of running a comprehensive diabetes management program for a ten-year period is roughly \$220 per patient. Also with data from HealthPartners and other research, we estimated the lifetime discounted value of health improvements accruing to a diabetic patient to be approximately \$59,000. The value of the cost savings from reduced utilization of medical services is approximately \$5,560 per patient. The value of increased workplace productivity depends on the proportion of diabetics who are working and the nature of the work that they do. We do not have the data to confidently estimate the value of enhanced workplace productivity, so we omit this term. Our calculations therefore indicate a net societal benefit of about \$64,000 per diabetic adult. These benefits are substantially greater than the \$220 cost.

Clearly these are not precise calculations, but this crude analysis illustrates a general point that professionals in health care have known intuitively for some time: at the societal level, effective diabetes disease management programs are clearly worth the investment. Furthermore, our analyses are likely to underestimate the business case at the societal level due to the omission of potential productivity gains.

## **WHY IS DIABETES CARE SO POOR?**

The difference between the very large societal benefits and the small private costs for diabetes management is evidence of fundamental problems inherent in our current systems for delivering and financing health care. Why does the health care system lead to such poor outcomes? We offer some hypothesized explanations in this section.

### **Adverse selection**

Plans with high quality disease management programs are more likely to attract sick patients than plans with lower quality programs. Under most circumstances, a reputation for high quality is very valuable to a firm. However, because diabetic patients require substantially more medical care services than non-diabetic patients, and because health plans typically do not receive higher payments for sicker patients, a good reputation for chronic care may lead to health plan financial losses. It is worth noting that adverse selection is a cost to particular health plans but not to society as a whole (when one plan enrolls more diabetic members, other plans enroll fewer) and hence does not impact the societal cost-benefit analysis.<sup>20</sup>

The data compiled for our analyses may be supplemented to generate an estimate of the potential costs of adverse selection. With data from the disease surveillance system operated by the Centers for Disease Control, we compared the prevalence of diabetes at HealthPartners to the prevalence in the adult population in Minnesota. As shown in **Exhibit 12**, the prevalence of diabetes at HealthPartners in 1994 exceeded the prevalence in the Minnesota adult population by 60%, and this “excess” rate of diabetes increased over the time period of our study such that in 2000, the prevalence at HealthPartners was more than double the prevalence in the Minnesota adult population. If we assume that the faster prevalence growth at HealthPartners was caused entirely by improvements in diabetes care (and thus disproportionately more diabetic patients joining HealthPartners), this implies that by the year 2000, the DM program had attracted approximately 0.6 new diabetic members for every 1994 diabetic enrollee. Over the time period 1994-2000, the average cost for a diabetic patient at HealthPartners equaled 484% of the average cost of a non-diabetic patient. We estimate the adverse selection costs to HealthPartners by multiplying the number

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<sup>20</sup> This statement about zero net costs to society is true only to the extent that diabetics in other plans are not going undiagnosed or undertreated. If new diabetic enrollees at HealthPartners were not diagnosed or undertreated, then in the short run, costs to HealthPartners and society would increase but would almost certainly be offset by the longer term medical care cost savings owing to DDM.

of “excess” diabetic patients by the extra costs of treating a diabetic patient (compared to a non-diabetic patient) for each year of our study. In 2000 the present value of the annual adverse selection cost was \$2338 per 1994 diabetic enrollee per year. Cumulative costs were \$8972 per 1994 diabetic enrollee over the six year period. This estimate suggests that adverse selection costs could far exceed the benefits of high quality diabetes care and present a serious deterrent to health plans adopting these programs when premiums paid to the plan are not risk adjusted.<sup>21</sup>

It should be noted that employers also face a potential adverse selection problem if they contract with health plans that have high quality disease management programs and the employer’s health benefit attracts employees with these diseases. There is ample evidence in the literature that individuals with chronic disease have a larger number of missed work days and, depending on the specific physical demands of the job, may have lower on-the-job productivity.

### **Turnover**

We, and others, have argued that it is instructive to conceptualize diabetes disease management as an investment in the health of diabetic patients. The largest component of medical care cost savings attributable to effective diabetes care is the avoidance of complications of diabetes that result in hospital utilization; our analyses suggest that the cost savings could be substantial even if only a few members per year were affected. However, the health plan/provider will accrue these savings only if the diabetic patients remain in the plan, possibly up to 10 years after entering the program, since the most costly complications of diabetes typically do not manifest until 7-10 years following disease onset. If the average tenure of patients enrolled in diabetes management is 18-24 months, as our interviews with experts at the AAHP, ADA and others suggest may often be the case, then much of the expected medical care cost savings will be lost to the plan implementing the program. The problem may be more minor than these figures suggest: disenrollment rates of adults with diabetes were evaluated in the HPMG study population in the mid-1990s and were reported to be 4-5% per year (Gilmer et al., 1997). Even with these rates, however, turnover clearly reduces the health plan’s economic case for diabetes disease management.

The cost of turnover to HealthPartners was included in the analysis reported in **Exhibit 9** since the results reported there are based on the medical care costs of a repeated cross-section of HealthPartners diabetic enrollees rather than the medical care costs of the 1994 cohort. Since new “unmanaged” diabetic

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<sup>21</sup> This would only apply if the health plan is capitated by the payer. CMS, for example, does not have many patients in capitation arrangements—thus the health plan does not suffer financially on such patients at present.

patients replaced the “managed” diabetic patients who left HealthPartners (see the 1994 cohort attrition evident in Exhibit 2), our estimated benefits of the disease management program are lower than if there was no turnover among diabetics at HealthPartners. Note however, that this cost-benefit calculus depends crucially on the design of the payment system. If the purchaser does not adequately compensate the plan for the additional costs of caring for a diabetic patient (i.e. the payments are not risk adjusted), then the financially optimal strategy for the health plan is to avoid diabetic patients altogether. If this cannot be done, it is preferable to have no attrition among diabetic patients than high levels of turnover, since attrition reduces the gains from intensive management (assuming that new diabetic patients are less well managed than departing diabetic patients). But even random attrition is preferred to adverse selection. If there were a payment system that adequately compensated for the costs of higher risk patients, the rank order of these strategies is nearly reversed. A plan with a good management program will then be happy to attract additional diabetic patients, because it would accrue the medical care cost savings of managing the patients’ diabetes over time. A situation of stable enrollment would also be satisfactory, and the worst situation would be to have no diabetic patients, since the health plan has built up an asset, its organizational capability for managing diabetes, on which it can earn no return.

Employee turnover also moderates the size of employer’s expected benefit from (and hence willingness to pay for) disease management. Employers will realize benefits from chronic disease management programs to the extent their covered employee turnover rate is low: complications prevented seven to ten years in the future will not benefit a firm whose employees move on after two or three years unless absenteeism is reduced and on the job productivity is enhanced in the short term.

### **Contracting**

One factor that stood out sharply in the societal analysis was the benefit accruing to patients from diabetes management in the form of longer life in a healthier state. Good health is one of those goods we frequently take for granted; however, a recent series of articles in the New York Times demonstrates just how devastating and debilitating diabetes can be.<sup>22</sup> One might expect that diabetes patients would be willing to pay an increased premium for disease management programs. However, to the best of our knowledge, such payments almost never occur. Charging higher premiums to support disease management programs seems to not be feasible at this time.

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<sup>22</sup> See Kleinfield, 2006a and 2006b

The reasons for this are somewhat complex. In the first instance, insurers would charge employers more to pay for such programs. Employers would be willing to pay these amounts if they realized productivity benefits from such programs (which were not offset in higher wages), or if workers were willing to pay for them in the form of less rapid wage increases. This is the traditional way that employee health benefits have been paid for (Summers 1989; Gruber 1994). The large health benefits accruing to consumers from disease management suggest that some such compensation could take place.

The observation that consumers do not typically pay additional premiums for disease management may have multiple explanations: consumers don't understand the benefits of DDM, consumers don't know for certain that they will benefit from a specific disease management program, consumers do not face the marginal cost of additional health care services resulting from poor disease management, or consumers believe they will not accrue the benefits of improved disease management in the form of higher wages. For whatever reason, however, the necessary offsets do not occur. It is also possible that those individuals who are most likely to become diabetes patients are least able to pay for additional health care services in the form of disease management.

There are contracting difficulties on the supply side as well. Changing physician practice patterns is a critical step for implementing successful disease management. Physicians must adopt office procedures that support population health management such as active outreach to patients rather than waiting for them to come to the office. Traditional reimbursement systems often generate insufficient incentives to support these changes. Physicians do not in general receive special reimbursements from health plans for their diabetic patients. The Resource Value Unit (RVU) payment system used as the basis for many fee-for-service fee schedules allows little or no reimbursement for many of the most valuable diabetes management services, such as reminders about appointments and medication usage; group management visits; and telephone or electronic follow-up and communication. In addition, the costs of start-up information systems are not reimbursed. HealthPartners Medical Group has recently encountered a similar problem: the cost of diabetes education staff is not reimbursed by the health plan, leading the medical group to consider reducing its staff in this area. Intuitively, one might think that capitation would allow providers the greatest flexibility in choosing the types of services to deliver to diabetic patients. However, if providers are paid on a capitation basis without adequate risk adjustment, as is common, they will be penalized financially from an increase in the number of diabetes patients on their panels. This generates disincentives for providers to deliver high quality chronic disease care.

Underlying some of these contracting problems is the challenge of measuring performance of diabetes disease management. This is an issue both in

contracts between health plans and providers and between health plans and purchasers. Compared to other chronic diseases, there is a relatively large and comprehensive set of established measures for diabetes management. At least one health plan that we know of has used these measures in an explicit pay for performance contract with physicians (Beaulieu and Horrigan, 2005). However, many challenging issues remain in specifying the details of such contracts for diabetes management; much more research and experimentation will be required before we can broadly implement similar pay for performance programs for other diseases.

### **Network externalities**

Another explanation for the divergence between the private business case and the societal case for disease management relates to provider networks. In response to consumer demand for broader access, many health plans have expanded their provider networks to include a majority of providers in the market. As a result, most health plans have non-exclusive contracts with their providers (staff-model HMOs, like HPMG being a notable but diminishing exception). One consequence of these contracting arrangements is a high degree of overlap among health plan provider networks (Chernew et al., 2004). Provider network overlap presents challenges for bringing about changes in care delivery. When health plans consider making investments to improve quality of care, they consider how that investment is likely to affect the demand for their product in the marketplace. If quality improvements initiated by one health plan spill over to the care delivered to members of other health plans, as they do when physicians update their practice patterns, then the original health plan making the investment will not realize a significant return (Beaulieu, 2003). A type of catch-22 may be at work. Employers may be unwilling to pay higher premiums because they know that physicians treat all their patients in the same way, whatever health plan they belong to. Thus, employers face incentives to free-ride off the investments of others.

Overlapping provider networks have other implications as well. When physicians treat patients from multiple plans, they have to balance the interests of multiple payers; different incentive schemes, guidelines, formularies, and reporting requirements may have the effect of stymieing the changes in office and clinical practices that would lead to improvements in care. Furthermore, incentives for change created by one plan may be attenuated because they affect only a small share of a doctor's patients. It is therefore unsurprising that truly comprehensive diabetes programs are predominantly offered by staff model HMOs or mixed-model HMOs that have their roots in a staff-model or group-model plan (Rundall, et al., 2002). In these plans, there is only one payer, and thus

one set of incentives. Ironically, staff and group model HMOs are disappearing in the United States. However, there are delivery organizations other than staff model HMOs that are interested in and potentially capable of developing DDM programs. A recent CMS demonstration program that provided adequate financial incentives to support DDM drew about 80 thoughtful applications from around the country. This suggests that reasonable financial support for chronic disease and diabetes management programs could foster implementation of systems nation-wide.

## **DISCUSSION AND POLICY IMPLICATIONS**

The gap between the business case and the societal case for diabetes disease management has a number of policy implications. Addressing the financing issues is one policy avenue. The reimbursement system could be changed to pay providers on the basis of the *quality* of the services provided, rather than the *quantity* of services provided (Cutler, 2004). This would reward high quality diabetes care over poorer quality care, but would require risk-adjusting payments. Another potential change is the revision of the fee-for-service payment schedule to add reimbursement for non-standard interactions such as group visits and electronic or telephonic communication. Purchasers (private and public) could also pay health plans a quality premium. Such a payment policy would begin to address the problems associated with member turnover and delayed cost-savings, since the payment would offset the plan's financial outlay on improved care.

Government insurance programs, particularly Medicare, have an interest in supporting high-quality diabetes programs, since the reduction in costs from complications will most often occur at least partly in the patient's old age, when he or she is enrolled in Medicare. So it seems reasonable to ask whether Medicare could be charged some amount to subsidize disease management programs.

Second, the paucity of convincing research on the workplace productivity effects of healthier employers may partly explain the lack of employer financial support for disease management programs. Carefully constructed experiments conducted in the workplace could yield valuable information in this regard, and possibly encourage employers to stimulate the provision of disease management programs by paying for quality improvements.

Third, cheaper access to clinical data would not only support health plans and providers in changing the way they deliver chronic disease care, it would also enable the implementation of payment and reimbursement policies based on quality of care. To date, there are no industry standards for electronic medical records (EMRs). The financial investment required to grant providers access to the necessary hardware and software is also daunting. Still, it is hard to envision

effective chronic disease management without patient and provider access to the clinical data required for monitoring patient health.

An important question is whether disease management should be provided by traditional health insurers or by carve-out disease management companies. These companies could act as contractual intermediaries between consumers and providers, and implement payment for quality outside of the scope of a traditional insurance policy. In a market with multiple insurance plans, having a single carve-out company would eliminate adverse selection, and care could be portable across insurers. Such a solution has disadvantages, however, including the potential decrease in care coordination resulting from the separation of ordinary care from diabetes care, and the possible duplication of infrastructure investment. Because there are private disease management companies currently in operation, it would be feasible to formally evaluate the relative efficiency of delivering care through these types of organizational and contractual arrangements, as CMS has started to do.

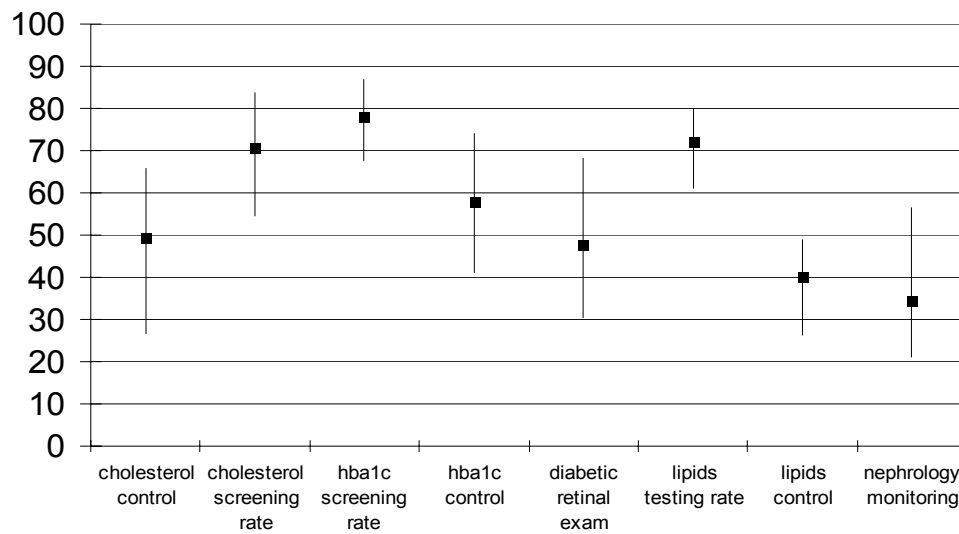
## **EXTENSIONS & LIMITATIONS**

The principles of disease management have been adapted for the care of other chronic diseases. A number of health plans have initiated chronic disease management programs for conditions such as asthma, congestive heart failure, HIV/AIDS, cancer, and depression. The quantitative analyses presented in this case study apply only to the business case for diabetes management. The time pattern of the cost savings from averted complications will differ across conditions, and thus the business case will as well. However, the costs and benefits of disease management enumerated in this study are quite general and thus the framework we employ would be applicable to other conditions.

Our detailed findings are particular only to HealthPartners. HealthPartners has been repeatedly recognized for excellence in health care delivery and for their diabetes program in particular. Thus, the challenges that HealthPartners faced in implementing their disease management program may be only a subset of the implementation challenges that would face other organizations. How the organizational costs and benefits of disease management vary by organizational form is a subject worthy of future research.

**EXHIBITS**

**Exhibit 1: HEDIS Comprehensive Diabetes Care Rates, 2000: Un-weighted Median, 10<sup>th</sup> and 90<sup>th</sup> percentiles**



**Exhibit 2: Diabetic populations at HealthPartners**

Year	HPMG 1994 Cohort	HPMG Cross-Section	HealthPartners Cross-Section
1994	6292	6440	13120
1995	5724	6791	14945
1996	5085	7415	16791
1997	4669	7400	18945
1998	4223	8353	22048
1999	3881	9428	23871
2000	3535	8817	22364
2001	Not available	N/A	24051
2002	N/A	N/A	25889
2003	N/A	N/A	25731
2004	N/A	N/A	26545

**Exhibit 3: Diabetes Disease Monitoring at HealthPartners**

Year	HbA1c Testing Rates			LDL Testing Rate		
	HPMG 1994 Cohort	HPMG Cross Section	HP Cross Section	HPMG 1994 Cohort	HPMG Cross Section	HP Cross Section
1994	81	79	N/A	N/A	N/A	N/A
1995	80	80	N/A	27	27	N/A
1996	81	78	N/A	28	27	N/A
1997	84	80	N/A	35	31	N/A
1998	84	77	N/A	43	38	N/A
1999	70	74	N/A	49	43	N/A
2000	81	78	N/A	68	65	N/A

**Exhibit 4: Intermediate Health Outcomes at HealthPartners**

Year	Average HbA1c Levels			Average LDL Levels		
	HPMG 1994 Cohort	HPMG Cross Section	HP Cross Section	HPMG 1994 Cohort	HPMG Cross Section	HP Cross Section
1994	8.7	8.6	8.7	N/A	N/A	N/A
1995	8.3	8.2	8.3	132	132	N/A
1996	8.3	8.0	7.9	130	130	N/A
1997	8.2	8.1	7.8	124	126	N/A
1998	8.1	7.8	7.8	118	120	N/A
1999	7.8	7.5	7.7	113	116	109
2000	7.7	7.5*	7.5	97	115*	104
2001	N/A	7.2*	7.1	N/A	110*	101
2002	N/A	7.3*	7.4	N/A	109*	102
2003	N/A	7.1*	7.1	N/A	97*	96
2004	N/A	N/A	6.8	N/A	N/A	86

\* Sperl-Hillen JM, O'Connor PJ. 2005. Factors driving diabetes care improvement in a large medical group: ten years of progress. *Am J Managed Care*; 11:S177-S185.

**Exhibit 5: Physiological Control at HealthPartners**

Year	% with HbA1c < 8			% with LDL < 130		
	HPMG 1994 Cohort	HPMG Cross Section	HP Cross Section	HPMG 1994 Cohort	HPMG Cross Section	HP Cross Section
1994	31	34	N/A	N/A	N/A	N/A
1995	36	41	N/A	N/A	13	N/A
1996	38	43	N/A	N/A	14	N/A
1997	41	44	N/A	N/A	18	N/A
1998	43	47	N/A	N/A	24	N/A
1999	43	51	57	N/A	29	44
2000	53	57	61	N/A	49	51
2001	N/A	N/A	72	N/A	N/A	63
2002	N/A	N/A	67	N/A	N/A	61
2003	N/A	N/A	74	N/A	N/A	68
2004	N/A	N/A	67	N/A	N/A	70

**Exhibit 6: Incidence of Adverse Health Events among Diabetics at HealthPartners**

Year	Amputations per 1000	New Diabetic Retinopathy	Myocardial Infarction per 1000	Cases of ESRD per 1000
1994	10.7	N/A	13.5	N/A
1995	9.5	77.6	15.8	N/A
1996	6.7	67.1	14.7	N/A
1997	7.0	69.5	13.4	N/A
1998	5.1	67.7	13.4	N/A
1999	5.1	57.7	14.1	N/A
2000	4.8	66.6	14.0	N/A
2001	4.9	57.4	11.6	2.3
2002	4.5	59.8	12.4	1.4
2003	4.0	56.1	12.6	1.3
2004	4.5	62.1	12.0	1.0

**Exhibit 7: Diabetic Disease Management Program Costs**

<b>Year</b>	<b>Average Costs per Patient per Year (Discounted)</b>	<b>Cumulative Discounted Per Patient Costs</b>
<b>1995</b>	31	31
<b>1996</b>	28	58
<b>1997</b>	24	82
<b>1998</b>	26	108
<b>1999</b>	24	132
<b>2000</b>	25	158
<b>2001</b>	22	180
<b>2002</b>	19	199
<b>2003</b>	18	217
<b>2004</b>	17	233

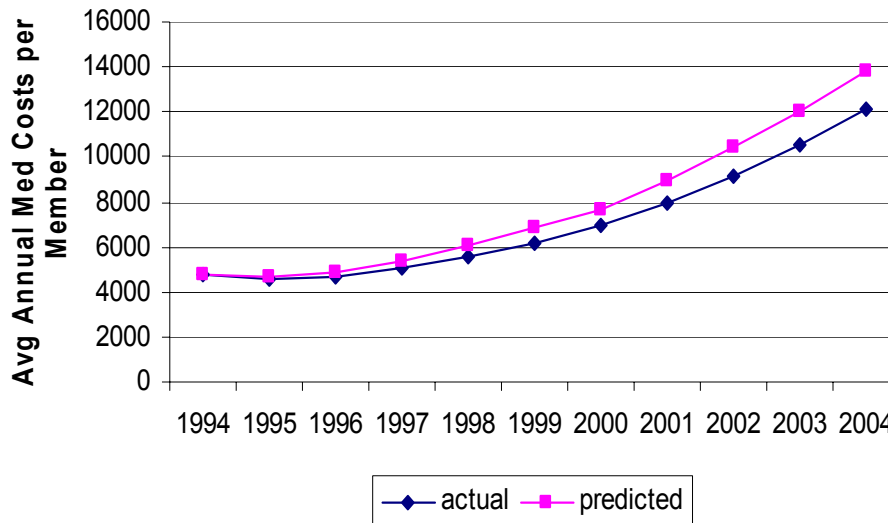
**Exhibit 8: Actual and Predicted Diabetes-Related Medical Expenditures for Diabetic Members at HealthPartners**

<b>Year</b>	<b>Average Annual Medical Costs per Diabetic Member (1)</b>	<b>Average Annual Medical Costs per Non-Diabetic Member (2)</b>	<b>Growth in Average Medical Costs per Non-Diabetic Member (3)</b>	<b>Predicted Medical Costs for Diabetics based on Non-Diabetic Cost Growth Rate (4)</b>	<b>Annual Medical Cost Savings (Losses) per Diabetic Member (5)</b>
<b>1994</b>	\$4,988	\$968		-	
<b>1995</b>	4,935	979	0.01	\$5,043	\$108
<b>1996</b>	5,073	1,030	0.05	5,308	235
<b>1997</b>	5,402	1,122	0.09	5,782	380
<b>1998</b>	5,922	1,255	0.12	6,466	544
<b>1999</b>	6,632	1,429	0.14	7,359	727
<b>2000</b>	7,533	1,643	0.15	8,461	929
<b>2001</b>	8,624	1,897	0.16	9,773	1,149
<b>2002</b>	9,906	2,192	0.16	11,294	1,388
<b>2003</b>	11,379	2,528	0.15	13,024	1,645
<b>2004</b>	13,042	2,905	0.15	14,964	1,921

**Exhibit 9: Net Savings/Losses for Diabetes Care at HealthPartners (per diabetic member)**

Year	Diabetes Medical Care Cost Savings (Losses)	Diabetes Disease Management Program Costs	Annual Net Savings (Costs)	Discounted Net Savings (Costs)	Cumulative Discounted Net Savings (Costs)
1995	\$108	-\$31	\$77	\$72	\$72
1996	235	-30	205	179	251
1997	380	-27	353	288	539
1998	544	-32	513	391	931
1999	727	-32	695	496	1,426
2000	929	-36	893	595	2,021
2001	1,149	-33	1,116	695	2,716
2002	1,388	-31	1,357	790	3,506
2003	1,645	-31	1,614	878	4,384
2004	1,921	-31	1,891	961	5,345

**Exhibit 10: Actual and Predicted Medical Costs of Diabetic Enrollees, HealthPartners**



**Exhibit 11: Costs and Benefits of Diabetes Management Programs**

	<b>Benefits</b>	<b>Costs</b>
<b>Patient/ Purchaser</b>	<p>Improved quality/length of life</p> <ul style="list-style-type: none"> <li>• Net of non-monetary costs of changing behaviors</li> </ul> <p>Possible productivity gains</p> <ul style="list-style-type: none"> <li>• Reduced absenteeism and enhanced OTJ productivity</li> </ul> <p>Long term benefits depend on the patient staying with the company</p>	<p>Higher premium paid for DM program</p> <ul style="list-style-type: none"> <li>• If the health plan can charge for it</li> </ul> <p>Out of pocket expenses (e.g. copayments)</p>
<b>Plan/Provider*</b>	<p>Potential medical care cost savings over time</p> <ul style="list-style-type: none"> <li>• Magnitude depends on how long patient stays in the plan</li> </ul> <p>Higher premium for DM program</p> <ul style="list-style-type: none"> <li>• If the health plan can charge for it</li> </ul> <p>Out of pocket payments by patients</p>	<p>Setup costs (e.g.IT systems)</p> <p>Operating costs</p> <ul style="list-style-type: none"> <li>• Medical care (e.g. nurses, drugs, PCPs)</li> <li>• Program administration (e.g. education materials, staff)</li> </ul> <p>Adverse selection costs (to one plan, not the system)</p>
<b>Net to Society</b>	<p>Improved quality/length of life</p> <ul style="list-style-type: none"> <li>• Net of non-monetary costs of changing behaviors</li> </ul> <p>Potential long-run medical care cost savings due to lower use of acute services over time</p> <p>Potential productivity gains</p>	<p>Setup costs</p> <p>Operating costs</p>

\*Note: the division of costs and savings between plan and providers depends on reimbursement arrangements and mobility of patients

**Exhibit 12: Estimated Costs of Adverse Selection to HealthPartners**

Year	Prevalence of Diabetes in Minnesota	Prevalence of Diabetes in HealthPartners	“Excess” Growth in Prevalence Since 1994	“Excess” diabetic patients per 1994 diabetic patient	Estimated Discounted Cost Premium per Diabetic Patient per year	Total Discounted Adverse Selection Costs Per 1994 Diabetic Patient per year	Cumulative Adverse Selection Costs Per 1994 Diabetic Patient
1994	3.5%	5.6%			\$4,019		
1995	3.8	6.4	0.5%	0.09	3,697	\$341	\$341
1996	3.8	7.4	1.5	0.26	3,531	929	1,270
1997	4.4	8.2	1.8	0.31	3,493	1,098	2,367
1998	4.5	9.6	3.0	0.54	3,560	1,906	4,274
1999	4.8	10.4	3.6	0.64	3,710	2,360	6,634
2000	4.7	10.1	3.3	0.60	3,925	2,338	8,972

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