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Impact of a Managed Care Disease Management Program on Diabetes Care

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Abstract

Objective—To determine if processes and outcomes of diabetes care improved between 2000 and 2006 in a managed care health plan with a comprehensive diabetes disease management program.

Study Design—Cross-sectional

Methods—In 2000, 1650 randomly-selected diabetic members completed surveys and in 2006, 1256 randomly-selected diabetic members completed surveys. Survey and medical record data were analyzed using multivariable regression and predictive probabilities adjusted for age, education, and comorbidities.

Results—In 2006, patients were more likely to have proteinuria assessed (85% in 2006 vs. 74%), foot exams performed (90% vs. 86%), HbA1c (94% vs. 87%) and lipid levels measured (81% vs. 70%), aspirin advised (67% vs. 56%), and influenza immunizations performed (70% vs. 63%). HbA1c decreased by 0.60% ($p<0.0001$), systolic blood pressure by 3 mmHg ($p=0.002$), and LDL cholesterol by 18 mg/dl ($p<0.0001$). Those who were continuously enrolled in the health plan were significantly more likely to report having had dilated retinal exams ($p=0.003$), aspirin advised ($p=0.049$), and influenza immunizations performed ($p=0.004$), and to have lower LDL-cholesterol (by 6 mg/dL, $p=0.003$).

Conclusion—Implementation of a disease management program was associated with substantial improvements in both processes and outcomes of care over 6 years. Although secular trend likely contributed to some of the improvement, improvement in some measures was significantly associated with duration of enrollment in the health plan, making secular trend an unlikely explanation for all of our findings.

Despite a strong evidence base for diabetes care [1–5], diabetes care remains suboptimal in routine clinical practice [6]. Population-based care management strategies including

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establishment of registries, dissemination of guidelines, self-management support, care management, tailored patient and provider feedback, enhanced clinical information systems, and expansion of benefits have been shown to improve care for persons with chronic diseases [7,8]. These approaches to care underlie both the Chronic Care Model (CCM) and disease management [7,8]. Despite optimism regarding the benefits of interventions based on these strategies, improved processes of care have not been consistently linked to improved intermediate outcomes [8–11].

Between 1986 and 2007, the University of Michigan administered an independent practice association (IPA) model managed care health plan, M-CARE. The plan contracted with the University of Michigan and 42 other IPAs across southeastern Michigan. Approximately 5% of primary care providers were employed by the University of Michigan and 29% of diabetic patients received care from university providers. M-CARE integrated several care management strategies into a health plan-directed diabetes disease management program. M-CARE established a diabetes registry; disseminated guidelines; implemented targeted reminders for both patients and providers to improve processes (eye exams, renal screening, foot exams, A1c and lipid testing, and influenza immunizations) and intermediate outcomes of care (aspirin use, smoking cessation, ACE/ARB use, and A1c and LDL cholesterol control); incorporated nurse care management; and expanded benefits for members. M-CARE provided members access to diabetes education and nutritional counseling with no copayments, provided discounts for commercial weight loss programs, covered smoking cessation classes and pharmacologic aids to smoking cessation with no copayments, covered self-monitoring supplies and insulin with no copayments, and waived referral requirements and copayments for diabetic eye exams.

The purpose of this study was to assess the impact of M-CARE's comprehensive disease management program on the processes and outcomes of diabetes care.

Research Design and Methods

The study has been described elsewhere [12]. The study was performed at the University of Michigan site of Translating Research Into Action for Diabetes (TRIAD), a prospective observational study of diabetes care in managed care. The University of Michigan Institutional Review Board approved the study and all participants provided informed consent.

In 2000 and again in 2006, patients with diabetes who were ≥ 18 years of age, community dwelling, enrolled in the health plan for ≥ 18 months, not pregnant, and had at least one claim for health services were sampled at random from the health plan, surveyed, and had their medical records reviewed. In 2000, there were 3,972 eligible patients with diabetes and in 2006, there were 3,652 eligible patients with diabetes. In 2000, 1650 patients completed the survey by computer-assisted telephone interview or by mail (response rate=67%) and in 2006, 1256 patients completed the survey by mail (response rate=54%). For these analyses, we included patients who had both survey and medical record data (n=1349 in 2000 and n=1050 in 2006).

In both 2000 and 2006, processes of care were assessed over a 12-month period (except where noted) and included: dilated retinal exams; urine microalbumin or protein testing; foot exams; HbA1c and lipid testing; recommendation to take aspirin or aspirin use (measured over an 18-month period); and influenza immunization. We based performance of dilated retinal exams, foot exams, and recommendation to take aspirin or aspirin use on either self-report or medical record documentation. Influenza immunization was based on self-report, and urine, HbA1c, and lipid testing were based on documentation in the medical record. Intermediate health outcomes were defined as the last recorded values for HbA1c, systolic and diastolic blood pressure, and low-density lipoprotein (LDL) cholesterol and total cholesterol.

We stratified the populations by age and performed bivariate analyses using t-tests for continuous variables and chi-square tests for categorical variables. We also performed multivariable regression analyses adjusted for age, education, and comorbidities. We used logistic regression models to derive the adjusted (conditional) predicted probabilities of each outcome [13]. Conditional predicted probabilities may be interpreted as the percentage of persons receiving each process of care adjusted for age, education, and comorbidities. All analyses were performed using SAS (version 9.1.3 SP 4; Cary, NC).

Results

Between 2000 and 2006, the managed care organization stopped offering Medicare managed care. As a result, the percentage of persons with diabetes 65 years of age and older decreased from 50% to 6% and the 2006 population was significantly younger (mean age (± SD) 62±14 years in 2000 versus 52±10 years in 2006). There were statistically significant changes in the distribution of education, diabetes treatment, and comorbidities between 2000 and 2006 and a small increase in average body mass index (BMI) (Table 1).

The percentage of persons who received six of the seven processes of care improved between 2000 and 2006, as did intermediate health outcomes. Among patients 18–44 years of age, rates of lipid testing and recommendation to take aspirin or aspirin use improved significantly as did levels of HbA1c and LDL and total cholesterol (Table 1). Although blood pressure did not improve, mean systolic and diastolic blood pressures were at goal (<130 and <80 mmHg) at both points in time. In the group 45–64 years of age, urine microalbumin/protein, HbA1c and lipid testing improved significantly as did recommendation to take aspirin or aspirin use, influenza immunization, and HbA1c, systolic blood pressure, and LDL and total cholesterol levels (Table 1). In the group 65 years of age and older, all processes of care except dilated retinal exams and recommendation to take aspirin and all intermediate health outcomes improved significantly (Table 1).

After adjusting for age, education, and Charlson index, patients in 2006 were more likely to have urine microalbumin/protein assessed, foot exams performed, HbA1c tested, lipids tested, and to report having been told to take aspirin or to use aspirin (Table 2). They were also more likely to receive influenza immunizations (Table 2). Statistically significant improvements were seen in all intermediate health outcomes. HbA1c decreased by 0.60%, systolic blood pressure by 3 mmHg, diastolic blood pressure by 1 mmHg, LDL cholesterol

by 18 mg/dl, and total cholesterol by 24 mg/dl (Table 2). The proportion of patients with HbA1c <7%, blood pressure <130/80 mmHg, and total cholesterol <200mg/dl improved from 6% in 2000 to 19% in 2006.

To further assess the impact of the health plan's comprehensive diabetes disease management program on processes and outcomes of care, we stratified respondents by duration of health plan enrollment, a measure of disease management program exposure, and reassessed processes and outcomes of care. In the 2006 survey, 830 of 1,256 respondents (66%) reported that they had been continuously enrolled in the health plan for five years or more. After adjusting for age, education, and comorbidities, those who were continuously enrolled were significantly more likely to report having had dilated retinal exams (OR 1.66, 95% CI 1.19–2.30), influenza immunizations (OR 1.51, 95% CI 1.14–2.00), and to report having been told to take aspirin or to use aspirin (OR 1.32, 95% CI 1.00–1.75). They also had lower diastolic blood pressures (Δ=2 mmHg, p=0.009) and lower LDL cholesterol (Δ=6 mg/dl, p=0.003), and total cholesterol (Δ=7 mg/dl, p=0.015) than those who had been continuously enrolled for less than 5 years but more than 18 months.

Discussion

After 6 years of comprehensive diabetes disease management, six of seven diabetes processes of care and all measured intermediate health outcomes improved significantly. In 2006, mean systolic and diastolic blood pressure and LDL cholesterol levels for the population were at goal. Longer duration of enrollment in the health plan, a measure of exposure to care management, was associated with a greater likelihood of having dilated retinal exams, influenza immunizations, and being told to use or using aspirin and with lower diastolic blood pressure and LDL cholesterol levels.

Many of the components of the disease management program including establishment of a registry, dissemination of guidelines to providers and patients, enhanced clinical information systems, and care management were initiated between 1995 and 1999. Improvements in the targeting and tailoring of patient and provider feedback and expansion of benefits occurred largely between 2001 and 2005. Thus, our initial cross-sectional survey in 2000 assessed the impact of care enhanced by traditional elements of care management, and the follow-up survey in 2006 assessed the impact of further improvements in delivery system design including waiving copayments and expanding benefits. Our results suggest that these population-based care management strategies, including innovative changes in insurance benefit design, may improve both the processes and outcomes of diabetes care. Future studies should explore the independent contribution of traditional care management strategies and more innovative changes in delivery system design.

We acknowledge that the population changed dramatically from 2000 to 2006, driven by the fact that the managed care organization stopped offering Medicare managed care in 2002. In our multivariate models we adjusted for the major population differences in age, education, and comorbidities. We also conducted a sensitivity analysis for persons less than 65 years of age and found that this did not change the estimates or p-values (data not shown).

Because of the lack of a formal control group, we cannot say with certainty that the disease management program caused the observed changes. In addition, because the disease management program incorporated numerous interventions and was implemented over many years, we cannot quantify the impact of individual interventions on outcomes. It is likely that some of the observed improvements in processes and outcomes of care were due to secular trend. The finding that continuous health plan enrollment was associated with improvement in some processes and outcomes of care and the degree to which outcomes improved make secular trend a less likely explanation for all of our findings.

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References

1. Julius S, Majahalme S, Palatini P. Antihypertensive treatment of patients with diabetes and hypertension. Am J Hypertens. 2001; 14(11 Pt 2):310S–316S. [PubMed: 11721889]
2. Hansson L, Zanchetti A, Carruthers SG, et al. Effects of intensive blood-pressure lowering and low-dose aspirin in patients with hypertension: principal results of the Hypertension Optimal Treatment (HOT) randomised trial. HOT Study Group. Lancet. 1998; 351(9118):1755–62. [PubMed: 9635947]
3. Collins R, Armitage J, Parish S, Sleigh P, Peto R. MRC/BHF Heart Protection Study of cholesterol-lowering with simvastatin in 5963 people with diabetes: a randomised placebo-controlled trial. Lancet. 2003; 361(9374):2005–16. [PubMed: 12814710]
4. The Diabetes Control and Complications Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. N Engl J Med. 1993; 329:977–86. [PubMed: 8366922]
5. UK Prospective Diabetes Study (UKPDS) Group. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). Lancet. 1998; 352:837–53. [PubMed: 9742976]
6. Saaddine JB, Cadwell B, Gregg EW, et al. Improvements in diabetes processes of care and intermediate outcomes: United States, 1988–2002. Ann Intern Med. 2006; 144(7):465–74. [PubMed: 16585660]
7. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. JAMA. 2002; 288(14):1775–9. [PubMed: 12365965]
8. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness: the chronic care model, Part 2. JAMA. 2002; 288(15):1909–14. [PubMed: 12377092]
9. Ward MM, Yankey JW, Vaughn TE, et al. Physician process and patient outcome measures for diabetes care: relationships to organizational characteristics. Med Care. 2004; 42(9):840–50. [PubMed: 15319609]
10. Mangione CM, Gerzoff RB, Williamson DF, et al. The association between quality of care and the intensity of diabetes disease management programs. Ann Intern Med. 2006; 145(2):107–16. [PubMed: 16847293]
11. Selby JV, Swain BE, Gerzoff RB, et al. Understanding the gap between good processes of diabetes care and poor intermediate outcomes: Translating Research into Action for Diabetes (TRIAD). Med Care. 2007; 45(12):1144–53. [PubMed: 18007164]
12. The TRIAD Study Group. The Translating Research Into Action for Diabetes (TRIAD) study: a multicenter study of diabetes in managed care. Diabetes Care. 2002; 25(2):386–9. [PubMed: 11815515]
13. Rothman, KJ.; G, S. Modern Epidemiology. 1. Philadelphia, PA: Lippincott-Raven; 1998.

Take away points

- It is likely that secular trend contributed to some of the improvement in processes and outcomes.
- Improvement in processes and outcomes were significantly associated with duration of enrollment in the health plan

Table 1

Characteristics of the diabetic study populations and diabetes processes of care and health outcomes stratified by age in 2000 and 2006

	2000 Population (N = 1,349)	2006 Population (N = 1,050)	p-value
Patient Characteristics			
Age groups (N, %)			<0.0001
18–44 years	168 (12%)	245 (23%)	
45–64 years	508 (38%)	737 (70%)	
65+ years	673 (50%)	65 (6%)	
Age (mean years ± SD)	61 ± 14	51 ± 10	<0.0001
Male sex (N, %)	661 (49%)	513 (49%)	0.94
Race/Ethnicity (N, %)			0.067
Hispanic	33 (3%)	37 (4%)	
Black	150 (12%)	120 (12%)	
White	1,021 (79%)	772 (75%)	
Asian/Pacific Islander	18 (1%)	18 (2%)	
Other	77 (6%)	87 (8%)	
Education (N, %)			<0.0001
High school graduate or less	613 (46%)	212 (20%)	
At least some college	719 (54%)	834 (80%)	
BMI (kg/m^2) (mean ± SD)	31.6 ± 7.3	33.4 ± 8.4	<0.0001
Treatment (N, %)			<0.0001
Diet only	60 (4%)	84 (8%)	
Oral medication	763 (57%)	551 (52%)	
Insulin and oral meds	169 (13%)	187 (22%)	
Insulin only	357 (26%)	228 (18%)	
Duration of diabetes (mean years ± SD)	13 ± 11	11 ± 10	<0.0001
Charlson index (mean ± SD)	2.45 ± 1.63	1.73 ± 1.25	<0.0001
Processes of Care			
Dilated retinal exam performed (N, %)			
18–44 years	123 (73%)	189 (77%)	0.3615
45–64 years	410 (81%)	604 (82%)	0.5786
65+ years	547 (81%)	57 (88%)	0.2002
Urine microalbumin/protein assessed (N, %)			
18–44 years	117 (70%)	186 (76%)	0.1564
45–64 years	384 (76%)	639 (87%)	<0.0001
65+ years	501 (74%)	59 (91%)	0.0033
Foot exam performed (N, %)			
18–44 years	149 (89%)	221 (90%)	0.6208
45–64 years	440 (87%)	661 (90%)	0.0956
65+ years	569 (85%)	60 (94%)	0.0428
HbA1c tested (N, %)			

	2000 Population (N = 1,349)	2006 Population (N = 1,050)	p-value
18–44 years	145 (86%)	203 (91%)	0.1055
45–64 years	449 (88%)	659 (95%)	0.0001
65+ years	578 (86%)	63 (98%)	0.0044
Lipids tested (N, %)			
18–44 years	94 (60%)	164 (70%)	0.0367
45–64 years	349 (73%)	591 (82%)	<0.0001
65+ years	449 (69%)	54 (84%)	0.0096
Recommendation to take aspirin or aspirin use (N, %)			
18–44 years	43 (26%)	100 (41%)	0.0014
45–64 years	302 (59%)	505 (69%)	0.0010
65+ years	472 (70%)	53 (82%)	0.0526
Influenza immunization (N, %)			
18–44 years	83 (50%)	145 (59%)	0.0684
45–64 years	304 (60%)	498 (68%)	0.0047
65+ years	485 (73%)	56 (86%)	0.0220
Health Outcomes			
HbA1c (% ± SD)			
18–44 years	8.50 ± 1.89	7.84 ± 1.82	0.0007
45–64 years	8.03 ± 1.72	7.41 ± 1.55	<0.0001
65+ years	7.56 ± 1.47	6.93 ± 1.31	0.0010
Systolic blood pressure (mmHg) (mean ± SD)			
18–44 years	124 ± 17	124 ± 16	0.8820
45–64 years	132 ± 18	129 ± 15	0.0019
65+ years	138 ± 19	130 ± 15	0.0006
Diastolic blood pressure (mmHg) (mean ± SD)			
18–44 years	76 ± 11	75 ± 11	0.1852
45–64 years	77 ± 10	76 ±10	0.1266
65+ years	75 ± 11	72 ± 9	0.0530
LDL cholesterol (mg/dl) (mean ± SD)			
18–44 years	106 ± 31	94 ± 28	0.0003
45–64 years	110 ± 35	90 ± 30	<0.0001
65+ years	109 ± 34	85 ± 32	<0.0001
Total cholesterol (mg/dl) (mean ± SD)			
18–44 years	192 ± 40	173 ± 37	<0.0001
45–64 years	196 ± 47	170 ± 39	<0.0001
65+ years	192 ± 43	166 ± 42	<0.0001

Table 2

Predicted probability of diabetes processes of care occurring and changes in health outcomes between 2000 and 2006 adjusted for age, education, and comorbidities.

	Predicted probability 2000	Predicted probability 2006
Processes of Care		
Dilated retinal exam performed	80%	81%
Urine microalbumin/protein assessed	74%	85%**
Foot exam performed	86%	90%*
HbA1c testing	87%	94%**
Lipid testing	70%	81%**
Recommendation to take aspirin or aspirin use	56%	67%**
Influenza immunization	63%	70%*
Health Outcomes	**Change 2006 vs. 2000**	**p-value**
HbA1c (%)	−0.60	<0.0001
Systolic blood pressure (mmHg)	−2.55	0.0018
Diastolic blood pressure (mmHg)	−1.27	0.0096
LDL cholesterol value (mg/dl)	−17.95	<0.0001
Total cholesterol value (mg/dl)	−24.23	<0.0001

* p-value < 0.01

** p-value <0.0001