Adequacy of Glycemic, Lipid, and Blood Pressure Management for Patients With Diabetes in a Managed Care Setting

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OBJECTIVE — We conducted a retrospective study to evaluate the adequacy of glycemic, lipid, and blood pressure (BP) management for diabetic patients in a managed care organization (MCO).

RESEARCH DESIGN AND METHODS — Patients aged ≥18 years with diabetes (n = 7,114) were retrospectively identified over a 2-year period from the MCO’s administrative database based on the Health Plan Employer Data and Information Set 2000 selection criteria using pharmacy, laboratory, and encounter data. Analyses examined demographics and percent-ages of patients tested and meeting American Diabetes Association goals for HbA1c, lipids, and BP, both overall and for those receiving medication treatment versus no treatment.

RESULTS — Testing rates for A1C, LDL cholesterol, and BP were 77%, 54%, and 95%, respectively. The percentage of patients tested who were at goal were 37% for A1C, 23% for LDL cholesterol, and 41% for systolic BP. Of the patients in our sample, 72% were treated for glycemic control, 64% were treated for BP control, and only 28% were treated for lipid control. Of the patients who received medication treatment, less than one-third were at goal for A1C (29%) and LDL cholesterol (32%), whereas 40% were at goal for systolic BP.

CONCLUSIONS — We found that although a large percentage of diabetic patients were tested for A1C, LDL cholesterol, and systolic BP, a much smaller percentage had reached their respective goals. More aggressive glycemic, lipid, and BP management appears to be needed to improve care for these patients.

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Cardiovascular disease is the major cause of morbidity and mortality among diabetic patients, accounting for ~75% of hospitalizations and 70–80% of deaths (1,2). In fact, coronary heart disease (CHD) is the leading cause of death among diabetic patients, who have a two- to fourfold higher risk of CHD mortality and incidence of nonfatal CHD events compared with patients without diabetes (3).

Initiatives such as the Be Smart About Your Heart: Control the ABCs of Diabetes campaign (developed by the American Diabetes Association [ADA], the U.S. Department of Health and Human Services, and the National Diabetes Education Program) (4) and the ADA/American College of Cardiology’s Make the Link! Diabetes, Heart Disease and Stroke initiative (5) highlight the link between diabetes and cardiovascular disease. Both of these initiatives focus on comprehensive diabetes care and underscore the importance of managing blood glucose (A1C), blood pressure (BP), and cholesterol to targets recommended by the ADA guidelines.

Few studies report treatment and/or goal attainment rates for diabetic patients with respect to these risk factors (6–9). Aside from these few studies, there is little or no information on the management of patients with diabetes, especially within the managed care setting. Additionally, there has been little exploration of the possible differences in management by race/ethnicity.

To address these issues, we conducted a retrospective study to evaluate the adequacy of glycemic, lipid, and BP management for diabetic patients within a large staff model health maintenance organization. The primary objective of this study was to examine A1C, cholesterol (LDL, HDL, and triglycerides), and BP (systolic and diastolic) testing and goal attainment rates, and to examine differences in goal attainment rates between those diabetic patients receiving medication versus those not receiving medication. A secondary objective was to examine potential differences by ethnicity for testing, treatment, and goal attainment for the risk factors mentioned above.

RESEARCH DESIGN AND METHODS — The study population included all members of a large staff model managed care organization (MCO) in New Mexico who were continuously enrolled from 1 January 1999 through 31 December 2000 and who had a pharmacy benefit (n = 96,926), including those in a Medicare risk plan. Patients with diabetes (n = 7,114) aged ≥18 years were retrospectively identified from the MCO’s electronic administrative database using an adaptation of the National Committee for Quality Assurance’s Health Plan Em-
employer Data and Information Set (HEDIS) 2000 selection criteria. Patients were identified through pharmacy data (those with an insulin or oral hypoglycemic/antihyperglycemic prescription fill; 2.1%), encounter data (two or more outpatient visits with a diabetes diagnosis code [250.xx, 357.2, 362.0, 366.41, or 648.0] or one inpatient or emergency department encounter with a diabetes diagnosis code; 97.5%), and laboratory data (A1C results; 0.4%) obtained from the MCO’s administrative database. In addition, we also identified those patients with a diagnosis of hyperlipidemia (272.0, 272.1, 272.2, or 272.0) and/or hypertension (401.0, 401.1, or 401.9).

Because BP is not available in the MCO’s administrative data, and due to resource considerations, a medical chart review was conducted to obtain BP values for a sample of 409 patients randomly drawn from those with diabetes. This sample size of 409 was based on the mandated HEDIS sample size for measures requiring medical record review.

This MCO’s health plan, like most others, does not collect race/ethnicity information on its individual members, except in its Medicaid population. However, the MCO has access to special software, GUESS (Generally Useful Ethnicity Search System), that assigns ethnicity by the software, the only reliable classification for New Mexico are Hispanic and non-Hispanic. This MCO’s population is predominantly Hispanic and non-Hispanic white with very low proportions of African Americans and Native Americans.

**Analyses**

Descriptive analyses included comparing demographic profiles of the diabetes population with those of the total health plan population. For the overall diabetic sample, we calculated the percentage of patients who were tested, treated, and at goal for each of the risk factors over the 2-year study period and used \( \chi^2 \) statistics to determine significance.

For each primary risk factors (A1C, LDL cholesterol, and systolic BP), we identified individuals who 1) had at least one medication fill during the study period (insulin or oral hypoglycemic agent, lipid-lowering medication, or antihypertension medication for A1C, lipids, or systolic BP, respectively) or 2) had no medication fill. We then examined treatment and goal attainment rates for these subgroups with respect to glycemic, lipid, and BP management. We also examined differences in A1C, lipid, and BP treatment and goal attainment by ethnicity (Hispanic versus non-Hispanic) for the groups for each risk factor.

The goals used for this study were those specified by the 2003 ADA guidelines (11): 1) A1C <7%, 2) LDL cholesterol <100 mg/dl, 3) HDL cholesterol >45 mg/dl, 4) triglycerides <150 mg/dl, and 5) systolic BP <130 mmHg and diastolic BP <80 mmHg. We particularly focused on systolic BP as a risk factor because research has shown systolic BP to be more predictive of CHD death and cardiovascular disease risk (12).

**RESULTS** — As expected, patients in the diabetic sample were older and more likely to be male than in the continuously enrolled health plan population (Table 1). There were significantly more Hispanics in the diabetic population (46.1%) than in the overall health plan population (35.9%) (\( P < 0.001 \)), validating the significance; for age range the difference was small but reached statistical significance (\( P < 0.05 \)).

**Testing and medication rates**

Over the 2-year study period, 77.4% (\( n = 5,505 \)) of the 7,144 diabetic patients were tested at least once for A1C, 54.0% (\( n = 3,845 \)) were tested for LDL cholesterol, and 94.9% of the chart review sample had a documented BP reading (388 of 409). We recognize that the standard of care for patients with diabetes is to have these risk factors measured at least annually, but we wanted to ensure a sufficient time period to allow for testing results. Of the 5,005 patients with an A1C test, only 683 (12.4%) did not have an A1C test during the most recent year.

Table 2 shows the percentage of diabetic patients on medications; 72.3% for glycemic control medications, 27.5% for lipid-lowering medications, and 63.8% for antihypertensive medications. Of those diabetic patients who also had a hyperlipidemia diagnosis (2,093 of 7,114), 64.9% were taking a lipid-lowering medication (of the 5,021 diabetic patients with no hyperlipidemia diagnosis, 11.9% were taking a lipid-lowering medication). Of the diabetic patients in the chart review sample who also had a hypertension

| Table 1—Demographic characteristics for the health plan population and the diabetes sample |
|-----------------------------------------------|-----------------------------------------------|
| Health plan population | Diabetes sample | Chart review sample for BP |
| n                          | 96,926               | 7,114               | 409               |
| Age (years)                | 49.5 ± 17.5          | 61.7 ± 13.6         | 64.1 ± 12.5       |
| Age range (years)          | 18–39                | 40.0 ± 15.3         | 14 (3.4)          |
| 40–59                      | 42.0 ± 11.3          | 26.6 ± 7.5          | 136 (33.3)        |
| 60–79                      | 22.6 ± 13.3          | 3.4 ± 1.6           | 216 (52.8)        |
| >80                        | 4.6 ± 1.8            | 6.2 ± 1.8           | 43 (10.5)         |
| Sex                        | 44.6 ± 16.1          | 3.6 ± 15.3          | 207 (50.6)        |
| Male                       | 52.2 ± 15.9          | 3.5 ± 13.9          | 202 (49.4)        |
| Female                     | 34.8 ± 16.7          | 2.7 ± 16.7          | 176 (43.0)        |
| Ethnicity                  |                      |                    |                  |
| Hispanic                   | 34.8 ± 15.9          | 2.7 ± 16.7          | 176 (43.0)        |
| Native American            | 1.2 ± 0.4            | 0.1 ± 0.4           | 9 (2.2)           |
| Non-Hispanic               | 60.8 ± 16.2          | 2.7 ± 16.7          | 224 (54.8)        |

Data are means ± SD or frequency (percent).
diagnosis (213 of 409), 86.9% were on antihypertensive medications (of the 196 patients in this sample with no hypertension diagnosis, 38.8% were taking an antihypertensive medication).

**Glycemic, lipid, and BP profiles**

Table 3 shows the glycemic and lipid profiles for health plan members with diabetes (n = 7,114) who received at least one glycemic or lipid test (with values available) within the study period. Although the largest percentage of patients fell in the optimal category for glycemics (37.2% with A1C <7%), 30.1% had an A1C between 7–8% (30.1%) and 32.7% had an A1C >8%. For lipid levels, only 22.5% were at goal (<100 mg/dl) for LDL cholesterol; however, when the LDL cholesterol cut point was increased to 130 mg/dl, this proportion increased to 67.1%. About 37% had HDL cholesterol >45 mg/dl, and 34% had triglyceride values <150 mg/dl. Table 3 also includes BP profiles for the sample of 409 diabetic patients included in the chart review with BP readings available. Of the 388 patients with BP values, 41.2% had a systolic BP <130 mmHg and 54.1% had a diastolic BP <80 mmHg. There were 28.6% who were at goal for both systolic and diastolic BP (<130/<80 mmHg). A much larger percentage of patients were at goal for diastolic than systolic BP, and this difference was even greater when comparing patients with high-risk BP; 37.2% of systolic patients had BP ≥140 mmHg compared with 11.7% of diastolic patients with BP ≥90 mmHg.

**Treated versus untreated subgroups**

Diabetic patients with an A1C, LDL cholesterol, or BP test were separated into those either taking or not taking a medication for glycemic, lipid, and BP control. Figure 1 shows that for glycemic control, goal attainment rates were twice as high for treated (59.7%) versus untreated (29.1%) patients. In contrast, the reverse relationship was shown for LDL cholesterol; almost twice as many treated (31.5%) versus untreated (17.1%) patients were at goal. For systolic BP, there was little difference between treated and untreated patients (39.9 vs. 43.6%).

**Differences across ethnicity**

Because the percentage of Native-American patients with diabetes was very low for this MCO (1.4%) they were not included in the ethnicity analysis. In examining differences by ethnicity, we found a signifi-
Hispanics (30.4%; 26.8%) were at goal for A1C than non-significantly lower percentage of Hispanics (41.0%), this difference was not significant (P < 0.10).

Of those treated for glycemic control, a similar percentage of Hispanic (22.0%) and non-Hispanic patients (23.6%) had an A1C <7%. There were also no differences in goal attainment among those who received lipid-lowering agents between Hispanic (22.5%) and non-Hispanic patients (23.8%). Although BP goal attainment was lower among Hispanics treated with antihypertensive medication (32.1%) compared with treated non-Hispanics (41.0%), this difference was not significant (P < 0.10).

Relationship between A1C, lipid, and systolic BP levels

Finally, we examined the relationships between glycemic level and lipid and BP levels for those patients with both A1C and lipid or BP scores. Of the 3,656 patients with both A1C and LDL cholesterol scores, 37.7% were at goal (<7%) for A1C and 24.3% were at goal (<100 mg/dl) for LDL cholesterol (10.0% were at goal for both A1C and LDL cholesterol). However, over half of the patients in this subgroup had high-risk scores for either A1C (>8%) or LDL cholesterol (>130 mg/dl) (30.2 and 32.0% of patients, respectively), and 385 patients (11.3%) had high-risk scores for both A1C and LDL cholesterol.

The relationship between A1C and HDL cholesterol was somewhat better than with LDL cholesterol; 45.2% of the 4,609 patients with both A1C and HDL cholesterol had high-risk scores for either A1C (>8%) or HDL cholesterol (<35 mg/dl) (8.3% had high-risk scores for both factors). For A1C and triglycerides, of the 3,784 patients with scores for both risk factors, 1,347 (35.6%) had high-risk scores for either A1C or triglycerides (3.4% had high-risk scores for both factors).

For the BP chart review sample of 409 patients, there were quite different distributions between systolic and diastolic pressures and A1C. Of the 367 patients with both A1C and BP scores, 43.3% had either A1C or systolic high-risk scores (6.8% had both A1C and systolic high-risk scores). But only 31.9% of the 367 patients with A1C and diastolic scores had high-risk scores for either risk factor (1.4% had both A1C and diastolic high-risk scores).

CONCLUSIONS — The results of this study show that although overall testing and medication rates were fairly high (with the exception of LDL cholesterol), goal attainment was modest for all three risk factors (glycemic, lipid, and systolic BP control). In this study overall, a greater proportion of patients were tested for A1C than for LDL cholesterol. For BP, ~95% of the randomly selected sample of patients had documentation of BP level.

With respect to goal attainment, much lower rates were found: 37% for A1C, 23% for LDL cholesterol, and 41% for systolic BP. And even these poor goal attainment rates are deceptively high since the denominators do not include those patients with no tests conducted during the 2-year study period. Medication rates for glycemic control were almost three times higher when compared with those for lipid control (72 vs. 28%), and almost two-thirds of the chart review sample were treated with BP medications.

Similarly, when examining a breakdown of those patients receiving versus not receiving medication, differences were found for goal attainment. Although high rates of goal attainment were found for A1C among untreated patients (60%) and for systolic BP among treated and untreated patients (40 and 44%, respectively), the very low goal attainment rate for LDL cholesterol with treated patients (17%) was surprising. Reasons for the differences between treated and untreated patients are not clear. Although it is likely that patients who are the most “out of control” may be the ones receiving medications, it is also true that those not on medications may be better able to control their risk factors through diet. Nevertheless, it is disappointing to find so many patients on medications unable to attain their glycemic, lipid, or BP goals.

Our data are somewhat better than the data of Straka et al. (13), who reported slightly lower lipid treatment (25%) and goal attainment (21%) rates for patients with diabetes and without CHD in a staff model MCO from 1996 to 1998. However, Straka et al. did not examine treatment or goal attainment for glucose or BP control.

A limitation to our findings, however, is that data for this retrospective study were restricted to the years 1999 through 2000. One would expect higher levels of goal attainment at present, i.e., 3 years later. For example, Karter et al. (14) found a greater percentage of patients in 1996–1998 with high-risk A1C scores than our study. A longitudinal study would be needed to validate this expectation.

Additionally, we believe it is important to examine not just goal attainment but also the distribution of values across the range of for all the risk factors (Table 3) in order to better understand where the challenges lie in managing patients with diabetes. For example, although a larger proportion of patients had HDL chole-
terol >45 ml/dl (37%) than LDL cholesterol <100 ml/dl (20%), an even larger difference existed when examining the proportion with high-risk HDL cholesterol <35 ml/dl (25%) than LDL cholesterol ≥160 ml/dl (8%). This suggests that concentrating efforts on goal attainment alone may create a similar “disconnect” between simply reaching the ADA goal versus providing good diabetes management for all patients, even those not yet at goal.

Finally, a distinctive feature of our study was that the diabetic sample included a significantly higher percentage of Hispanics (46%) than the overall health plan, which is consistent with the higher diabetes prevalence rate found in many parts of the U.S. Although the differences between Hispanics and non-Hispanics with respect to goal attainment for any of the risk factors were relatively small, we believe the statistical significance indicates that MCOs need to monitor differences in ethnicity.

In summary, these findings show that, within the managed care setting, diabetic patients still continue to be untreated or undertreated for glycemic, lipid, and BP management, which in turn is associated with a low rate of goal attainment. This treatment gap was even greater for lipid control compared with glycemic and BP control in our study. Moreover, despite much higher treatment rates for glucose control, A1C goal attainment among diabetic patients was nevertheless modest. The results of our study provide further evidence of the need to implement aggressive glycemic, lipid, and BP management to improve goal attainment, thereby contributing to a reduction in the burden of cardiovascular disease among patients with diabetes.

References