

Meeting American Diabetes Association Guidelines in Endocrinologist Practice

CHRISTOPHER D. MILLER, MD
LAWRENCE S. PHILLIPS, MD
MARY K. TATE, BS
JOANNE M. PORWOLL, MSN

SANDY D. ROSSMAN, MSN
NANCY CRONMILLER, RD
SUZANNE S.P. GEBHART, MD

OBJECTIVE — To determine whether American Diabetes Association (ADA) guidelines can be met in the context of routine endocrinology practice.

RESEARCH DESIGN AND METHODS — Charts were reviewed for a group of patients who were examined in 1998, followed for ≥ 1 year, and had two or more visits during that year. Process measures and metabolic outcomes were studied for patients with type 2 diabetes, and glycemic control was assessed for patients with type 1 diabetes.

RESULTS — A total of 121 patients with type 2 diabetes had a mean age of 63 years, a mean BMI of 31 kg/m², and a mean duration of diabetes of 12 years. Many had comorbidities or complications: 80% had hypertension, 64% had hyperlipidemia, 78% had neuropathy, 22% had retinopathy, and 21% had albuminuria. Management of type 2 diabetic patients was complex: 38% used oral hypoglycemic agents alone (54% of these were using two or more agents), 31% used oral hypoglycemic agents and insulin, and 26% used insulin alone; 42% of patients taking insulin therapy injected insulin three or more times per day. Within 12 months, 74% of patients had dilated eye examinations, 70% had lipid profiles, and 55% had urine albumin screening. Of the patients, 87% had a foot examination at their last visit. Blood pressure levels averaged 133/72 mmHg, cholesterol levels averaged 4.63 mmol/l, triglyceride levels averaged 1.99 mmol/l, HDL cholesterol levels averaged 1.24 mmol/l, and LDL cholesterol levels averaged 2.61 mmol/l. Random blood glucose levels averaged 8.0 mmol/l, and HbA_{1c} levels averaged 6.9 \pm 0.1%. A total of 87% of patients had HbA_{1c} levels \leq 8.0%. A total of 30 patients with type 1 diabetes had mean age of 44 years, a mean BMI of 26 kg/m², and a mean duration of diabetes of 20 years. All type 1 diabetic patients used insulin and averaged 3.4 injections a day; their average HbA_{1c} level was 7.1 \pm 0.2%, and 80% had HbA_{1c} levels \leq 8.0%.

CONCLUSIONS — Although endocrinologists must manage patients with multifaceted problems, complex treatment regimens yield glycemic control levels comparable with the Diabetes Control and Complications Trial and allow ADA guidelines to be met in a routine practice setting.

Diabetes Care 23:444–448, 2000

Strong evidence exists that good diabetes management results in significant benefits. In 1993, the Diabetes Control and Complications Trial (DCCT) showed that intensive insulin treatment significantly reduced the development and progression of microvascular complications in patients with type 1 diabetes (1). Both

the Kumamoto Study (2) and the U.K. Prospective Diabetes Study (UKPDS) (3) showed that intensive therapy reduced microvascular complications in patients with type 2 diabetes as well. Evidence also exists that aggressively managing cardiovascular risk factors in patients with diabetes is beneficial. A subgroup analysis of the Scandinavian Simvastatin Survival Study (4) showed that patients with diabetes who took simvastatin had a significant reduction in major coronary heart disease events, and the UKPDS found that tight blood pressure (BP) control in patients with type 2 diabetes reduced the risk of stroke, microvascular disease, and deaths related to diabetes (5).

Despite such reinforcement for aggressive management, many patients continue to receive suboptimal care. Although the American Diabetes Association (ADA) guidelines for desired HbA_{1c} values, lipid and BP goals, and screening procedures have been widely distributed, these goals often are not met in the primary care settings where most patients receive their diabetes care (6–10). However, few studies have focused on specialist practice, and whether specialists are able to meet ADA guidelines is not clear. In 1995, the Medical Outcomes Study (11) found no “meaningful differences” in health outcomes (including glycemic control) in patients with diabetes who were treated by specialists or generalists. On the other hand, the DCCT showed that specialists could achieve good results in diabetes management in a study setting at a substantial cost (12). In short, limited evidence shows that diabetes specialists can meet ADA guidelines in routine practice. To determine whether DCCT-level glycemic control and adequate screening can be attained in this context, we assessed the quality of care for patients with diabetes managed by academic endocrinologists at the Emory Clinic.

RESEARCH DESIGN AND METHODS — The Emory Clinic in Atlanta, Georgia, includes the main outpatient practices of full-time Emory University faculty members on the staff of Emory University Hospital, which is a tertiary care referral center. The patient population varies in age, ethnicity, income level, and

From the Division of Endocrinology and Metabolism, Department of Medicine, Emory University School of Medicine, Atlanta, Georgia.

Address correspondence and reprint requests to Suzanne S.P. Gebhart, MD, Diabetes Unit, the Emory Clinic, 1365 Clifton Rd. N.E., Atlanta, GA 30322. E-mail: sgebhar@emory.edu.

Received for publication 20 July 1999 and accepted in revised form 9 December 1999.

S.D.R. holds stock in Novo-Nordisk, a company that manufactures products related to the treatment and management of diabetes.

Abbreviations: ADA, American Diabetes Association; BP, blood pressure; DCCT, Diabetes Control and Complications Trial; NHANES III, Third National Health and Nutrition Examination Survey; UKPDS, U.K. Prospective Diabetes Study.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

level of education. Of the patients at the Emory Clinic, 36% receive Medicare benefits, and 4% receive Medicaid. The Diabetes Unit at the time of this study was staffed primarily by two endocrinologists, two nurse practitioners, and a registered dietitian. Other endocrinologists examined ~15% of patients in the Diabetes Unit during the study period. Although the Emory Clinic is an academic setting, the physicians involved are expected to support their salaries with patient care efforts. This usually results in a physician examining 12–18 patients during each half day at the clinic.

Management overview

Although no set protocol exists, patients with type 2 diabetes are generally managed with individualized progressive intensification of therapy. Diet and exercise are encouraged with oral hypoglycemic agents as the initial pharmacological therapy. If patients exhibit poor glycemic control despite combinations of oral hypoglycemic agents, then insulin is frequently started with NPH insulin at bedtime. Finally, two or more daily insulin injections are used as needed to maintain tight glycemic control.

Physicians see patients in conjunction with nurse practitioners; visits with both physicians and nurse practitioners generally alternate with visits with nurse practitioners alone. Patients also have direct telephone access to nurse practitioners should patients have problems. The extensive use of physician extenders allows more frequent contact with patients and adjustment of therapy between office visits. Data from each visit are recorded on a flow sheet that stays with the patient's chart to allow easy review of laboratory data, screening tests, and medications. No formal system is in place to remind providers when screening tests are due.

Patients

By using the physicians' schedule data, charts were reviewed beginning with patients who had been seen most recently in December 1998. Working back through 1998, charts were examined until ~120 patients who met the inclusion criteria for type 2 diabetes were found. Assignment to the type 2 diabetes group was based on clinical criteria such as onset of diabetes at an age >30 years, current or prior use of noninsulin diabetes therapy, obesity, and lack of a history of diabetic ketoacidosis. Patients were included if they had seen the same endocrinologist (L.S.P. or S.S.P.G.) for

at least 1 year (to allow time for clinical practices to take effect) and had at least two visits during that year (to exclude patients who had only a single visit). Although the focus of the study was patients with type 2 diabetes, those patients encountered during chart review who had type 1 diabetes were included in a separate analysis.

Main data outcomes

Primary data for patients with type 2 diabetes included the most recent HbA_{1c}, random plasma glucose, and lipid profiles; whether patients had a dilated eye examination by an eye specialist, a urine albumin assessment, or a lipid profile within the last year; and whether patients had a foot examination recorded at their most recent visit. Treatment regimens were also assessed. In addition, rates of peripheral neuropathy, albuminuria, retinopathy, hypertension, hyperlipidemia, coronary artery disease, and peripheral vascular disease for the population were determined. Because of the small number of patients with type 1 diabetes, analysis of their data was limited to HbA_{1c} values and insulin regimens. Data were collected primarily from the flow sheet, but when these sheets were incomplete, office notes were examined. Finally, when demographic information could not be obtained from the chart (e.g., date of onset of diabetes), the patient was contacted directly by telephone. Telephone contact was necessary for <15% of patients.

Identifying complications

Most complications could be assessed from the flow sheet or from the most recent clinic note. Patients were classified as having a complication if it was included in the problem list in previous notes or if other criteria were met, including the following. First, peripheral neuropathy was diagnosed if vibratory sense at the distal end of the first metatarsal was <15 s or if the patient failed the standard 10-g filament test. Second, albuminuria was diagnosed if albumin excretion was >30 mg/24 h or if a spot urine albumin/creatinine ratio was >0.030 mg/mg. Third, diagnosis of retinopathy was based on patient self-reports from eye specialist visits or a history of laser or surgical therapy. Fourth, hypertension was diagnosed if the patient had been taking antihypertensive medication (other than ACE inhibitors if the patient had albuminuria) or if a recent BP measurement was >130/85 mmHg. Fifth, coronary artery disease was diagnosed if

problems such as angina, congestive heart failure, or myocardial infarction were included in the problem list. Sixth, hyperlipidemia was diagnosed if the patient was taking lipid-lowering medication, if a recent LDL cholesterol measurement was ≥ 3.36 mmol/l (130 mg/dl), or if a recent triglyceride level was ≥ 2.26 mmol/l (200 mg/dl) (per ADA guidelines that were operative in 1998) (13). Finally, peripheral vascular disease was diagnosed if the clinic notes documented diminished peripheral pulses, carotid bruits, or carotid or lower-extremity vascular surgery or if the patient had a history of nontraumatic amputation without evidence of peripheral neuropathy.

Laboratory data measurement

More than 90% of patients had HbA_{1c} values measured in the clinic with the DCA 2000 (Bayer, Elkhart, IN; normal range 3.4–6.2%). Of the 14 patients who did not have HbA_{1c} levels measured in the clinic, 10 had the test performed at Emory University Hospital (where the upper limit of normal is also 6.2%). Random glucose values during clinic visits (virtually all postprandial) were obtained using the One Touch II meter (Lifescan; Johnson & Johnson, Milpitas, CA). All other evaluations were performed using standard methodology either in the Emory University Hospital laboratory or in outpatient referral laboratories.

Statistical analysis

Statistical analysis was carried out with Statview 5.0 (SAS Institute, Cary, NC). Analysis of variance and unpaired two-tailed t tests were used to compare means between subgroups of patients. P values <0.05 were considered to be significant.

RESULTS

Demographics

A total of 151 patients were included in the study, and 80% had type 2 diabetes. Patients with type 2 diabetes were 53% men, were 26% African-American, had an average age of 63 years, had an average duration of diabetes of 12 years, and had an average BMI of 31 kg/m². The median number of visits was 4 (range 2–14) within the 12 months surveyed. For patients with type 1 diabetes, the average age was 44 years, the average duration of diabetes was 20 years, and the average BMI was 26 kg/m². Equal numbers of male and female patients had type 1 diabetes, and they were seen a median of four times (range 2–9).

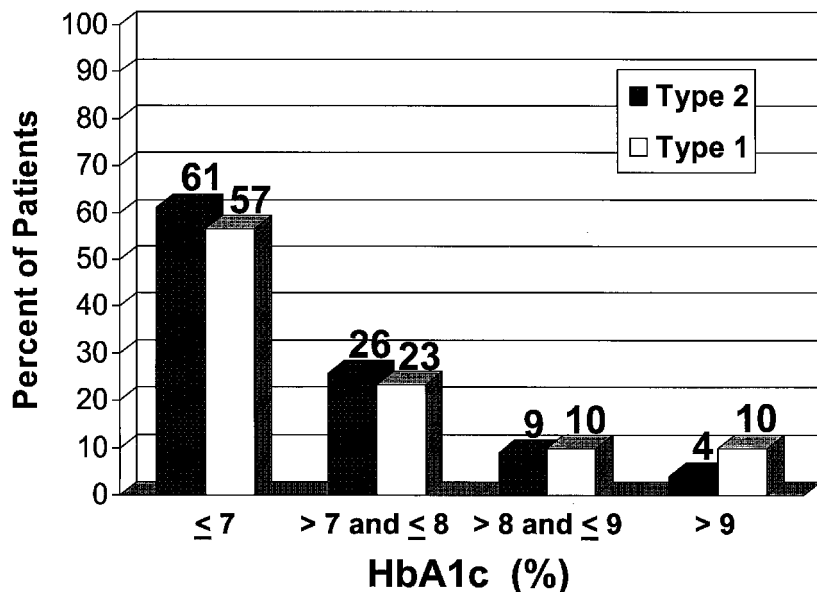


Figure 1—Distribution of HbA_{1c} values for type 2 ($n = 121$) and type 1 ($n = 30$) diabetic patients.

Diabetes complications

Many patients with type 2 diabetes had complications from their diabetes, and comorbidities were common. A total of 78% had peripheral neuropathy, 22% had retinopathy, 21% had albuminuria, 80% had hypertension, 64% had hyperlipidemia, 27% had coronary artery disease, and 14% had peripheral vascular disease.

Screening for diabetes complications

Screening studies in most patients with type 2 diabetes approached ADA guidelines. The rate of documented foot examinations at the most recent visit was highest at 87% of patients, followed by dilated eye examinations within the past year (74%) and lipid profiles within the past year (70%). Urine albumin screening was performed least frequently, with measurements within the past year in 55% of patients.

Metabolic outcomes

Patients with type 2 diabetes had an average BP level of 133/72 mmHg, an average cholesterol level of 4.63 mmol/l (179 mg/dl), an average triglyceride level of 1.99 mmol/l (176 mg/dl), an average HDL cholesterol level of 1.24 mmol/l (48 mg/dl), and an average LDL cholesterol level of 2.61 mmol/l (101 mg/dl). A total of 65% of patients were taking antihypertensive medications; of those, 62% had a BP level of $\leq 140/90$ mmHg, and 41% had a BP level of $\leq 130/85$ mmHg. A total of 55% of patients had been taking lipid-lowering medications. In

patients taking lipid-lowering medication, the total cholesterol level averaged 4.55 mmol/l (176 mg/dl), the triglyceride level averaged 2.10 mmol/l (186 mg/dl), the HDL cholesterol level averaged 1.24 mmol/l (48 mg/dl), and the LDL cholesterol level averaged 2.48 (96 mg/dl). In patients not taking lipid-lowering medications, the total cholesterol level averaged 4.78 mmol/l (185 mg/dl), the triglyceride level averaged 1.77 mmol/l (157 mg/dl), the HDL cholesterol level averaged 1.27 mmol/l (49 mg/dl), and the LDL cholesterol level averaged 2.82 mmol/l (109 mg/dl). For patients with type 2 diabetes, the random blood glucose level averaged 8.0 mmol/l (144 ± 6 mg/dl), and the HbA_{1c} level averaged $6.9 \pm 0.1\%$. A total of 61% of patients with type 2 diabetes had HbA_{1c} levels $\leq 7.0\%$, 87% had HbA_{1c} levels $\leq 8.0\%$, and 4% had HbA_{1c} levels $> 9\%$ (Fig. 1). Patients managed with diet therapy alone had significantly lower HbA_{1c} values (5.7%) than patients managed with a combination of oral hypoglycemic agents and insulin or insulin alone (both groups 7.2%; $P < 0.05$ vs. diet alone). HbA_{1c} levels for patients managed only with oral hypoglycemic agents (6.6%) did not differ significantly from the other groups. No difference in HbA_{1c} level was evident based on sex, race, duration of diabetes, or age (patients aged ≥ 65 vs. < 65 years).

Management

The management of patients with type 2 diabetes was complex, and nearly all

patients required pharmacological therapy (Fig. 2). Very few patients (5%) were managed with diet therapy alone. A total of 38% were managed with oral hypoglycemic agents alone, and 54% of these patients used more than one agent. The most common combinations of oral therapy were sulfonylurea/metformin (21% of the total patients managed with oral hypoglycemic agents alone) and sulfonylurea/troglitazone (17%). Of the patients, 57% were using insulin (either alone or in combination with oral hypoglycemic agents). Of those using insulin and oral hypoglycemic agents, 46% were taking an insulin sensitizer (metformin or troglitazone). Patients using any insulin averaged 64 U/day ($0.68 \text{ U} \cdot \text{kg}^{-1} \cdot \text{day}^{-1}$), and 42% were taking three or more daily injections. Overall, most patients (78%) required more than diet or a single oral hypoglycemic agent for adequate control.

Type 1 diabetes

All patients with type 1 diabetes were managed with insulin. They averaged 49 U ($0.66 \text{ U} \cdot \text{kg}^{-1} \cdot \text{day}^{-1}$) of insulin and 3.4 injections per day, and 87% were taking three or more daily injections. The mean HbA_{1c} level for patients with type 1 diabetes was $7.1 \pm 0.2\%$. A total of 57% of patients with type 1 diabetes had HbA_{1c} levels $\leq 7.0\%$, 80% had HbA_{1c} levels $\leq 8.0\%$, and 10% had HbA_{1c} levels $> 9\%$ (Fig. 1). Again, no significant difference was evident in HbA_{1c} levels based on sex, race, duration of diabetes, or age.

CONCLUSIONS— This study provides evidence that ADA guidelines and DCCT-level glyceemic control can be achieved in specialist practice. Although comorbidities and diabetes complications were frequent, patients with type 2 diabetes had good glyceemic control. Complex treatment regimens were necessary; only 22% of patients were treated solely with diet therapy or a single oral hypoglycemic agent. Most patients had appropriate screening examinations, and BP and lipid outcomes were also good.

These findings contrast with previous studies that were based mostly on patients in primary care settings and that often have shown glyceemic control to be relatively poor. Martin et al. (6) studied 378 patients with type 2 diabetes in 1992–1993 and found that mean HbA_{1c} values ranged from 8.6% in whites to 9.4% in blacks and 9.8% in Hispanics. In 1994, Weatherspoon et al.

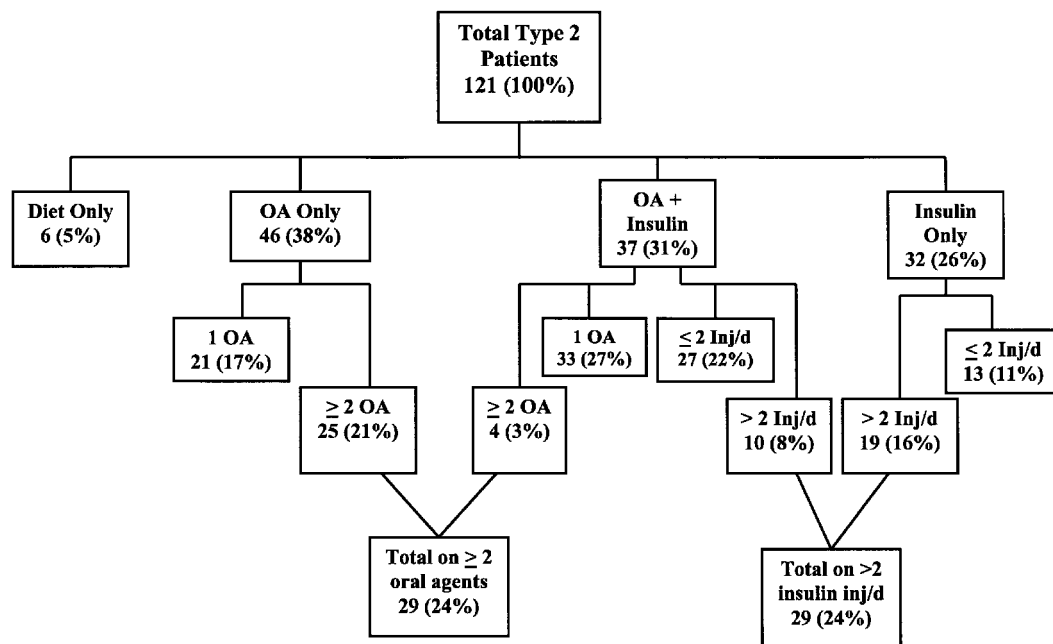


Figure 2—Distribution of therapy for patients with type 2 diabetes. Values are (%) of total type 2 patients. Inj/d, injections of insulin per day; OA, oral hypoglycemic agent.

(7) reported that nearly 40% of patients with type 2 diabetes had HbA_{1c} values of $\geq 8\%$. We found no significant difference in HbA_{1c} levels based on race, and only 15% of our patients with type 2 diabetes had HbA_{1c} levels of $\geq 8\%$. Most recently, Harris et al. (8) found a mean HbA_{1c} level of 7.6% in patients with diabetes in the Third National Health and Nutrition Examination Survey (NHANES III), but patients using only oral hypoglycemic agents (46% of patients) averaged HbA_{1c} levels of 8.0%, and patients using any insulin (27% of patients) averaged HbA_{1c} levels of 8.3%. In comparison, our group taking oral hypoglycemic agents only had average HbA_{1c} levels of 6.6%, and patients using any insulin had average HbA_{1c} levels of 7.2%.

Improved glycemic control in this study may be attributable to our use of complex therapeutic regimens. Although similar numbers of patients were using oral hypoglycemic agents only (38 vs. 46% in the study by Harris et al. [8]) and insulin only (26 vs. 24%), substantially fewer of our patients were using diet therapy alone (5 vs. 27%), and substantially more were using oral hypoglycemic agents plus insulin (31 vs. 3%). In addition, more of our insulin-treated patients were injecting insulin three or more times a day (42 vs. $\sim 4\%$) (8). Although we found that good control could be obtained with insulin dosages averaging

only $0.7 \text{ U} \cdot \text{kg}^{-1} \cdot \text{day}^{-1}$, insulin needs were likely reduced by the concomitant use of oral hypoglycemic agents.

In addition to metabolic outcomes, process measures are also important in good diabetes care. Screening rates in our patients with type 2 diabetes were generally good, especially for eye examinations and lipid profiles, and were somewhat higher than those previously reported for several groups of patients from large claims databases. In two studies of Medicare patients, 40–46% of patients had ophthalmological examinations, and 55–56% had lipid measurements during a 1-year period (9,10). Martin et al. (6) found that 53–66% of patients had annual ophthalmological examinations, 52–62% had at least one total cholesterol and one HDL cholesterol measurement during a 2-year period, and 56–63% had at least two urine dipstick tests during a 2-year period. Another study reported that 48% of 353 patients with diabetes had urine protein screenings (test not specified), but 92% had no documented foot examinations during a 1-year period (14).

Our data are not the first to suggest that specialists may be able to meet ADA guidelines better than primary care practice physicians. Ho et al. (15) have shown that process measures are addressed better by specialists, and Hellman et al. (16) achieved a median HbA_{1c} level of 7.3% in patients

who had received long-term care in their specialty practice. However, we believe our study is the first report to assess patient complexity and details of management in specialist practice.

The discrepancies between our data and those of primary care studies may be because of factors other than the type of treating physician. First, data used in the studies mentioned above are principally from the early 1990s and may not reflect current practices. Second, rapid on-site HbA_{1c} measurements are used routinely in our practice and may play a role in improving glucose control (17). We may have been referred and retained patients who are more motivated and therefore achieve better results. Although our self-selected population cannot be compared directly with inclusive surveys such as NHANES III, our patients have a longer duration of diabetes than the NHANES III population (8), which makes our patients potentially more difficult to manage (3). We believe that good glycemic outcomes are attributable to a commitment to achieving normal metabolic status that is reinforced through multiple contacts, including not only physician appointments but also nurse practitioner visits, dietitian visits, and telephone calls.

BP levels in our patients averaged 133/72 mmHg, which may reflect difficulty in regulating systolic BP in a popula-

tion with a 78% prevalence of neuropathy. All patients were not tested for diabetes complications during the 12 months of survey, and urine albumin screening was documented for only 55% of the patients, even though evaluation of convenient spot urine samples was common. Apparent failure to meet national guidelines may reflect the true limitations of our practice, but analysis was based largely on data recorded by hand in patient flow sheets and may have underestimated actual performance.

Other limitations of our study include its retrospective nature. In some cases, complications noted in the problem list could not be confirmed with the limited data available; for example, we do not know the actual retinal status of patients who did not have dilated eye examinations within the previous year and who were not described as having retinopathy previously. Also, our results may be population specific. The study population may have been biased toward those patients who had resources that permitted a median of four visits per year. Data on level of income and education were not collected, but a limited analysis of 50 patients who did not meet the study inclusion criteria revealed no significant differences in demographic characteristics, insurance mix, or HbA_{1c} level between the study sample and the excluded patients. In addition, review of on-site data from all clinic patients seen from October to December 1998 showed that follow-up patients who were not included in the study averaged HbA_{1c} levels of 7.1% (similar to levels in our study population) and that new patients during that period averaged HbA_{1c} levels of 8.5%, which is significantly higher than follow-up patients included or not included in the study. Thus, this study appears to be an accurate representation of our practice. Another limitation is the lack of data on the prevalence of hypoglycemia. Although we believe that severe hypoglycemia is uncommon in our patients, many patients using sulfonylureas or insulin report intermittent glucose levels of ~3 mmol/l (50–60 mg/dl). Finally, we were not able to assess the costs associated with our results.

In conclusion, we have shown that, in the context of routine specialist practice, achieving good control of glucose, BP, and lipid levels outside of a study protocol is possible, but to do so, complex treatment regi-

mens are required. Achieving substantial rates of screening for diabetes complications is likewise possible. Our data suggest that differences may exist in diabetes management in specialist versus generalist settings. Because the Medical Outcomes Study reflected patient management from 1986 to 1993 (largely before the completion of the DCCT) and included relatively few patients with diabetes and few endocrinologists (11), new prospective studies are needed to compare concurrent management, outcomes, and costs for the diabetes care given by specialists and generalists.

Acknowledgments— This work was supported in part by National Institutes of Health Grants T-32-DK-07298 (C.D.M.), DK-33475 (L.S.P.), and Agency for Healthcare Research and Quality Grant HS-09722 (L.S.P.).

The authors thank Natalie Berry, Cindy Robertson, and Cynthia Smith, who helped obtain critical demographic information, and the staff of the Emory Clinic.

Parts of this study were presented at the 59th Annual Meeting of the American Diabetes Association, San Diego, CA, 19–22 June 1999.

References

1. 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* 329:977–986, 1993
2. Ohkubo Y, Kishikawa H, Araki E, Miyata T, Isami S, Motoyoshi S, Kojima Y, Furuyoshi N, Shichiri M: Intensive insulin therapy prevents the progression of diabetic microvascular complications in Japanese patients with non-insulin-dependent diabetes mellitus: a randomized prospective 6-year study. *Diabetes Res Clin Prac* 28:103–117, 1995
3. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33): UK Prospective Diabetes Study (UKPDS) Group. *Lancet* 352:837–853, 1998
4. Pyörälä K, Pedersen TR, Kjekshus J, Faergeman O, Olsson AG, Thorgeirsson G, the Scandinavian Simvastatin Survival Study (4S) Group: Cholesterol lowering with simvastatin improves prognosis of diabetic patients with coronary heart disease: a subgroup analysis of the Scandinavian Simvastatin Survival Study (4S). *Diabetes Care* 20:614–620, 1997
5. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38: UK Prospective Diabetes Study Group. *BMJ* 317:703–713, 1998
6. Martin TL, Selby JV, Zhang D: Physician and patient prevention practices in NIDDM in a large urban managed-care organization. *Diabetes Care* 18:1124–1132, 1995
7. Weatherspoon LJ, Kumanyika SK, Ludlow R, Schatz D: Glycemic control in a sample of black and white clinic patients with NIDDM. *Diabetes Care* 17:1148–1153, 1994
8. Harris MI, Eastman RC, Cowie CC, Flegal K, Eberhardt MS: Racial and ethnic differences in glycemic control of adults with type 2 diabetes. *Diabetes Care* 22:403–408, 1999
9. Weiner JP, Parente ST, Garnick DW, Fowles J, Lawthers AG, Palmer RH: Variation in office-based quality: a claims-based profile of care provided to Medicare patients with diabetes. *JAMA* 273:1503–1508, 1995
10. Chin MH, Zhang JX, Merrell K: Diabetes in the African-American Medicare population: morbidity, quality of care, and resource utilization. *Diabetes Care* 21:1090–1095, 1998
11. Greenfield S, Rogers W, Mangotich M, Carney ME, Tarlov AR: Outcomes of patients with hypertension and non-insulin-dependent diabetes mellitus treated by different systems and specialties. *JAMA* 274:1436–1444, 1995
12. Resource utilization and costs of care in the Diabetes Control and Complications Trial. *Diabetes Care* 18:1468–1478, 1995
13. American Diabetes Association: Standards of medical care for patients with diabetes mellitus. *Diabetes Care* 21 (Suppl. 1):S23–S31, 1998
14. Peters AL, Legorreta AP, Ossorio RC, Davidson MB: Quality of outpatient care provided to diabetic patients. *Diabetes Care* 19:601–606, 1996
15. Ho M, Marger M, Beart J, Yip I, Shekelle P: Is the quality of diabetes care better in a diabetes clinic or in a general medicine clinic? *Diabetes Care* 20:472–475, 1997
16. Hellman R, Regan J, Rosen H: Effect of intensive treatment of diabetes on the risk of death or renal failure in NIDDM and IDDM. *Diabetes Care* 20:258–264, 1997
17. Thaler LM, Ziemer DC, Gallina DL, Cook C, Dunbar VG, Phillips LS, El-Kebbi IM: Diabetes in urban African-Americans. XVII. Availability of rapid hemoglobin A_{1c} measurements enhances clinical decision-making. *Diabetes Care* 22:1415–1421, 1999