WISCONSIN MEDICAL JOURNAL

# The Wisconsin Medical Society Diabetes Study

*Cynthia P. Helstad, PhD, RN; Susan M. Wiegmann, PhD; Jenny Camponeschi, MS; Seth Udlis, MD; Melissa Meredith, MD*

## ABSTRACT

*Problem:* Diabetes is a chronic and costly disease affecting approximately 330,000 people in Wisconsin. This study examined the association between use of clinical practice guidelines and outcomes of care.

*Methods:* Fourteen physicians from 3 diverse sites volunteered to recruit their adult patients with type 1 and type 2 diabetes who were in continuous care in 1999 and 2000. Of 757 randomly selected patients, 492 (65%) completed a mailed survey and 471 (62%) also gave consent for medical record review. Measures included diabetes management indicators, SF-36 scores, and patient satisfaction.

*Results:* Respondent age averaged 63 years (range 22-90 years) and 55% were men. While most clinicians measured blood pressure, lipids, and hemoglobin (A1c), less than half of the patients were at goal for these indicators. The process indicators explained a significant amount of the variability in physical functioning after controlling for demographics, comorbidities, diabetes-related factors, and clinician type. Overall, most respondents rated their diabetes care as excellent or very good and would recommend their clinician to family and friends.

*Conclusions:* Study patients with diabetes inconsistently met recommendations for diabetes self-management. While clinical care of study patients was often consistent with recommended guidelines, tremendous opportunities exist for achieving optimal blood pressure, A1c, and lipid levels.

## INTRODUCTION

Diabetes is a chronic and costly disease affecting approximately 330,000 people in Wisconsin. The estimated Wisconsin direct and indirect costs of illness total $1.26 billion and $1.54 billion, respectively.[1] Long-term complications of diabetes include heart disease, kidney disease, blindness, neuropathy, and stroke. In addition to the financial toll and medical complications, diabetes has an impact on quality of life for individuals experiencing this chronic disease.

Research indicates that interventions to manage diabetes can improve health outcomes.[2-5] However, gaps exist between evidence-based recommendations and current practice. Clinical practice guidelines have been developed to reduce this gap by improving clinical decision-making about effective interventions, with the expectation of improved health care processes and outcomes.[6] Guidelines have the greatest chance of changing clinical behavior when developed by the clinicians for whom they are intended. Locally developed practice guidelines are one means of improving the care and management of diabetes.[1,7]

In order to prevent or delay the numerous medical complications affecting people with diabetes, the Centers for Disease Control and Prevention (CDC) provided funding to the Wisconsin Department of Health and Family Services to establish the Diabetes Prevention and Control Program (DPCP). The DPCP formed the Wisconsin Diabetes Advisory Group, a committee of over 40 key stakeholders in diabetes care, which developed the *Essential Diabetes Mellitus Care Guidelines* (*Guidelines*) and began distributing them in 1998. The *Guidelines* are local practice guidelines aimed at improving the health care of people with diabetes. They serve as a tool to support and influence medical decisions, encouraging clinicians to provide consistent and comprehensive preventive diabetes care. In 2001 the DPCP revised the *Guidelines* to provide the latest information about best practices in light of new evidence.

In addition to developing the *Guidelines* and promoting their adherence, the DPCP wanted to evaluate the effect of distributing and promoting adherence to

Dr Helstad is Director of Research and Medical Education and Dr Wiegmann is Research Specialist at the Wisconsin Medical Society, Madison. Ms Camponeschi is an Epidemiologist with the State of Wisconsin, Division of Public Health, Madison. Doctor Udlis is Medical Director at Mercury Marine Family Medical Center, Fond du Lac. Doctor Meredith is Associate Professor of Medicine, University of Wisconsin Medical School, Madison, and Director, University of Wisconsin Clinical Diabetes Center.

them. Subsequently, the DPCP partnered with the Wisconsin Medical Society to measure guideline adherence and to provide clinicians with information for benchmarking health care quality. Detailed descriptions of the process used to develop the study protocol have been previously reported.[8] In summary, we formed a study group of interested practicing clinicians from around the state to design a study aimed at answering 2 questions:

1. To what extent are the *Wisconsin Essential Diabetes Mellitus Care Guidelines* being followed?
2. Is use of the *Guidelines* associated with desirable outcomes of care?

## METHODS

*Study Design*

The study design was a retrospective medical record review and current patient survey of randomly selected patients with diabetes at 3 Wisconsin clinics.

*Participants and Procedure*

Following a pilot test of the study procedures in 2001, patients participated in the study between March and July 2002. Fourteen physicians from 3 clinics (a large multispecialty clinic, an academic medical center, and a corporate-based family clinic) volunteered to participate in the study. Any willing primary care physician or endocrinologist, physician group, or health plan in Wisconsin was eligible to participate. Adult patients, 18 years or older, with type 1 or type 2 diabetes, in continuous care with 1 of the participating physicians in 1999 and 2000 were eligible to participate. We defined continuous care as 1 diabetes-related office visit in 1999 and 2 office visits (diabetes or non-diabetes related) in 2000. Patients with gestational diabetes (ICD-9 code 648.8) or diabetes insipidus (ICD-9 codes 235.5 and 588.1) were excluded.

Primary care physicians randomly selected a maximum of 50 patients meeting study eligibility criteria. Physicians with less than 50 eligible patients recruited all of their patients. Endocrinologists randomly selected 85-95 patients.

Study sites mailed survey forms to patients with a cover letter from their physician describing the study and informing patients of their rights. In addition to the survey questionnaire and cover letter, patients received a written consent form and a postage-paid envelope for returning completed materials to the study site.

*Measures*

The patient survey obtained patient perceptions about key processes and outcomes of comprehensive diabetes care, general health status, and satisfaction with medical service. The medical record review obtained objective information about diabetes-related visits, diabetes type, lab results, and medications.

**Demographics**—We collected information on date of birth and gender on the patient log and the patient survey. We also collected date of birth from the medical record as one of the cross checks for linking patient survey and medical record data. We collected data on race/ethnicity, marital status, education, and income using questions from the Personal Characteristics Form developed by the former Health Outcomes Institute.[9] We chose race categories using the 2-question format recommendations from the United States Office of Management and Budget.[10]

**Comorbidities**—Patient comorbidity information was collected on the patient survey using the Health Conditions Form developed by the former Health Outcomes Institute.[11] The patient survey inquired as to a history of several conditions, including congestive heart failure, blindness, deafness, arthritis, chronic back problem, lower extremity ulcer, lower extremity amputation, hypertension, angina, myocardial infarction, stroke, and kidney disease.

**Diabetes Classification**—Diabetes type was abstracted from the medical record. Information from face sheets, progress notes, diabetes flow sheets, and consultant notes were examined for documentation of type 1 or type 2 diabetes. To determine how long patients had lived with diabetes we asked "How old were you when you were first told that you had diabetes?"

**Indicators of Diabetes Care**—Indicators of diabetes care were grouped by glycemic control, kidney function monitoring, cardiovascular disease, eye care, foot care, self-management training, nutrition therapy, and tobacco use. Patients provided information about these aspects of their diabetes care. They also provided information about their health care utilization related to hospitalizations and emergency room or urgent care visits in the past year. Medical record abstraction was used to collect the following information: number of diabetes-related visits, hemoglobin (A1c) testing, weight measurement, urine microalbumin testing, urine protein testing, treatment for nephropathy, medication use, lipid monitoring, and blood pressure recordings.

**Health Status**—The Short-Form Health Survey (SF-36) was used to measure general health status.[12] The SF-36 includes 36 questions that provide a common metric

for comparing patients with health problems to the general population. The 36 questions are scored into 8 scales ranging from 0 to 100, with higher scores indicating better health. Two component summaries are computed from the 8 scales using norm-based methods so that both scales have a mean of 50 and a standard deviation of 10 in the general US population.[13]

**Satisfaction with Diabetes Care—**Patient satisfaction was measured using questions from the 1999 American Diabetes Association Patient Survey.[14] Patients were asked to rate their satisfaction with diabetes care provided during the past 12 months in 6 areas. Satisfaction was rated as poor, fair, good, very good, or excellent.

## RESULTS

*Respondent Characteristics*

Of 757 patients recruited for the study, 583 (77%) responded. Among those who responded, 21 patients were not in continuous care with the same physician, and 20 patients had moved away, died, indicated that they did not have diabetes, or given other reasons for not completing the survey. Comparing patients who completed a patient survey (n=492) to those who did not (n=265), there were no differences in average age ($t_{755}$=1.15, P=.25) or percent of men and women in the 2 groups ($\chi^2_1$=0.09, P=.77). Therefore, we believe the results would generalize to all patients in the participating physician practices.

Results are reported for all patients completing a patient survey. Some of those patients (n=21) did not consent to medical record review. Results for medical record review items are reported for all patients who consented to medical record review (n=471). Multiple regression analysis results are reported for patients with complete data on the predictor and criterion variables (n=431). Demographic information for patients completing a patient survey is presented in Table 1.

**Table 1.** Demographics

| Demographics | % |
|---|---|
| Age - mean (SD) | 63 (13.5) |
| White | 98% |
| Non-Hispanic | 98% |
| Married or Partnered | 75% |
| Lives Alone | 17% |
| Type 2 Diabetes | 77% |
| Years with Diabetes - mean (SD) | 16 (12.8) |
| High School Education | 85% |
| Income ≥ $40,000 | 48% |
| Travel Distance in Miles - mean (SD) | 26 (30.2) |
| Seen by Specialist | 54% |
| Patient Considered Primary Provider for Diabetes Care to be Physician who Sent Cover Letter. | 89% |

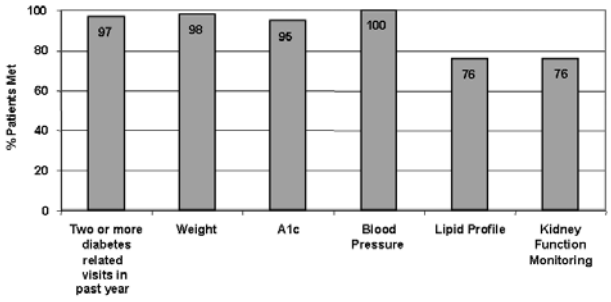


**Figure 1.** Diabetes management process indicators.

*Comorbidities*

Ninety-one percent of patients reported having at least 1 comorbidity, and 69% of patients reported 2 or more comorbidities. The most common comorbidities were hypertension (72%), arthritis (48%), deafness (26%), and chronic back problem (25%). Ten percent of patients reported kidney disease, 2% reported lower extremity ulcer, and 1% reported bilateral lower extremity amputation.

*Indicators of Diabetes Care*

**Process Indicators—**Results of diabetes management process indicators are presented in Figure 1 and Table 2. Most clinicians met guidelines for medical record documentation of visits, weight, A1c, blood pressure, lipids, and kidney function monitoring, and most patients reported that their clinician provided a dilated eye exam and foot exam in the past year. Fewer patients reported that they had seen a diabetes nurse educator or dietician in the past year, though most reported that information on nutrition, proper diet, and the importance of exercise had been provided to them. Most patients reported receiving information from their clinician on glycemic control and foot care. However, few patients reported that they checked their blood sugar twice daily or examined their feet daily. Two-thirds of patients over 40 reported taking aspirin regularly to reduce their chance of a heart attack.

**Outcome Indicators—**Results of diabetes management outcome indicators are presented in Figure 2. Of the patients with documented tests, less than half were at goal for blood pressure values < 130/85 mmHg, A1c ≤ 7.0%, and LDL <100 mg/dL in the reporting year, and

**Table 2.** Diabetes Management Process Indicators–Patient Survey

| Process Indicators | % |
|---|---|
| Patient had a dilated eye exam in past year | 84% |
| Provider did a foot exam in past year | 85% |
| Provider gave foot care information | 85% |
| Patient examines own feet daily | 41% |
| Dietician talked to patient in the past year | 38% |
| Diabetes nurse educator talked to patient in the past year | 47% |
| Provider discussed the importance of exercise in the past year | 83% |
| Provider discussed how to adjust eating habits in the past year | 76% |
| Provider instructed how to keep blood sugar near normal in the past year | 73% |
| Patient checks blood sugar at least twice daily | 44% |
| Patient is over 40 years and takes aspirin regularly | 68% |

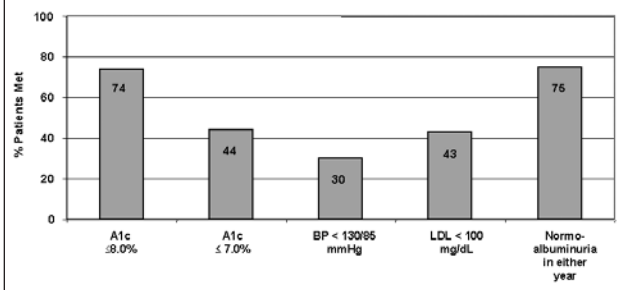


**Figure 2.** Diabetes management outcome indicators.

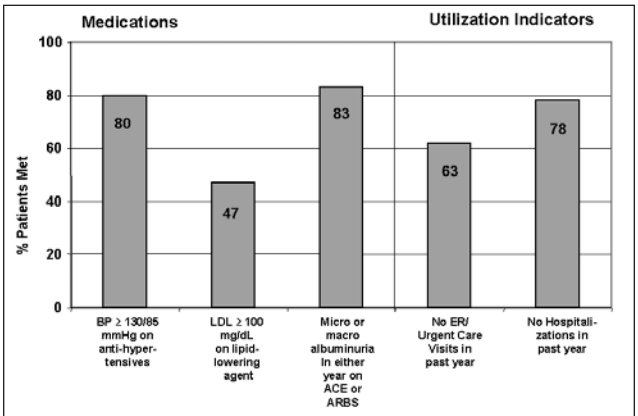


**Figure 3.** Medications and utilization indicators.

three-fourths were at goal for normoalbumin values in the prior or reporting year.

**Medications and Utilization Indicators—**Most patients with micro or macro albumin values in either year were on ACE inhibitors or angiotensin receptor blockers (ARBs), and most patients with uncontrolled hypertension were on ACE inhibitors, ARBs, or other anti-hypertensives. Only 27% of patients with hypertension on anti-hypertensives were at the blood pressure goal of <130/85 mmHg. Seventy-nine percent of patients with a documented lipid profile had hyperlipidemia in this study. Forty-three percent of patients were at the target of LDL < 100 mg/dL. Of these patients, 66% were on a lipid-lowering agent. Just over 50% of patients had an LDL ≥100 mg/dL and of those patients only 47% were on a lipid-lowering agent. Emergency room or urgent care visits and hospitalizations for any reason in the past 12 months were reported as 37% and 22% respectively (Figure 3).

*Health Status*

Compared to normative scores for the US population, study patient scores on the SF-36 Physical Component Summary scale were statistically significantly lower (indicating worse health). There was no significant difference on the Mental Component Summary scale scores for study patients compared to the US population. Compared to normative scores for patients with type 2 diabetes, study patients with type 2 diabetes scored significantly lower on the Physical Functioning, Bodily Pain, Vitality, and Physical Component Summary scales as shown in Figure 4.

*Patient Satisfaction*

Patients were most satisfied with the courtesy of the provider they saw and least satisfied with the ease of reaching someone in an emergency. Most patients would recommend their current diabetes care provider to family or friends (Table 3).

*Physical Functioning*

A multiple regression analysis was performed using the SF-36 Physical Functioning (PF) scale as the criterion variable and diabetes management process indicators, demographic information, comorbidities, diabetes-related factors, and clinician type as predictor variables. Table 4 shows the results of the multiple regression analysis. The overall model accounted for 35% of the variance in PF.

Controlling for other variables in the model, patients with type 2 diabetes scored significantly higher on the PF scale than patients with type 1 diabetes, and patients seeing a primary care clinician scored significantly higher on the PF scale than patients seeing a specialist. Other factors independently associated with higher PF scores were younger age, fewer years with diabetes, male gender, higher educational level, and

having less than 2 comorbidities. Process indicators significantly related to higher PF controlling for other variables in the model were not checking blood sugar twice daily and having kidney function monitored. Caruso et al also found a relationship between physical functioning and some of the same variables as the current study.[15]

The process indicators explained a significant amount of the PF variability after controlling for demographics, comorbidities, diabetes-related factors, and clinician type, $R^2$ change=0.05, F(14, 409)=2.44, P <.01.

## DISCUSSION

Adherence to the *Guidelines* was evaluated in this study. Among participating clinicians, *Guidelines* adherence associated with an office visit was excellent, with percentages ranging between 76% and 100% whereas 38%-68% of patients adhered to recommended regimens. Most patients reported that their clinician had provided them with educational information related to their diabetes care, but few reported following through on self-management such as checking their blood sugar at least twice daily or examining their feet daily. Clinicians at all of the study sites said their patients had access to dietician and diabetes educator services but patients often did not take advantage of their referrals. For guidelines to be successfully implemented and improve the processes and outcomes of health requires clinician adherence as well as patient adherence to clinical recommendations.[6]

Compared with other reports of key diabetes management indicators, study physicians' results for A1c screening and kidney function monitoring were better than those reported by the Wisconsin Collaborative Diabetes Quality Improvement Project[4] and the Wisconsin Collaborative for Health Care Quality.[16] In terms of LDL-cholesterol screening, the Collaborative for Healthcare Quality reported screening within the last 24 months whereas the Wisconsin Quality Improvement Project and the current study reported percentages based on annual screenings as recommended in the *Guidelines*. This finding highlights one of the critical concerns about comparative reporting: common measurement definitions. Within our own study group, there were differences in opinion about whether, given the lag in transferring research into practice, we should report results consistent with the recommendations of the latest clinical studies or the prior recommendations. For example, concerning LDL-cholesterol, the study group felt that general practitioners were treating patients to the 130 mg/dL target not the 2000 recommendation of 100 mg/dL. As we prepared the manuscript, a new study suggested that a more intensive lipid-lowering therapy is required than is currently recommended by national guidelines.[17] For the purpose of this study, we decided to report the results in terms of the latest evidence at the time of data collection. Readers must look carefully to make sure they are comparing the same things as definitions may be inconsistent across quality reports.

It was anticipated that adherence to the clinical practice *Guidelines* would be associated with better health outcomes. Results of our study indicated that while most clinicians met the guidelines for measuring blood pressure, lipids, and A1c, less than half of the patients were at goal for these indicators. In addition, the

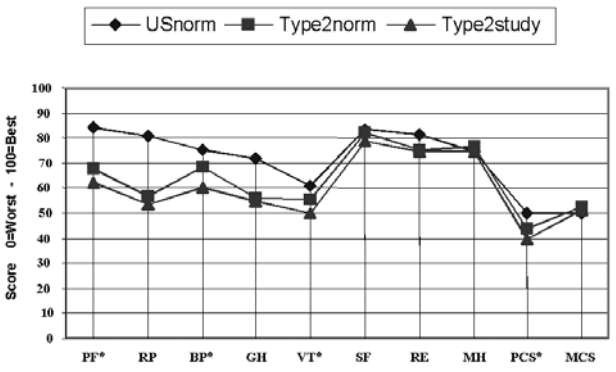


**Figure 4.** SF-36 general health status.
* Significant difference between normative scores for patients with type 2 diabetes and scores for study patients with type 2 diabetes (P<.01).
SF-36 Scale Descriptions:

| | |
|---|---|
| PF=Physical Functioning | RP=Role-Physical |
| BP=Bodily Pain | GH=General Health |
| VT=Vitality | SF=Social Functioning |
| RE=Role-Emotional | MH=Mental Health |
| PCS=Physical Component Summary | MCS=Mental Component Summary |

**Table 3.** Patient Satisfaction

| Thinking about the care you have received from your current diabetes care provider in the past 12 months, how would you rate your provider on the following? | % Excellent or Very Good |
|---|---|
| Diabetes care overall? | 84% |
| How well your diabetes questions were answered? | 84% |
| Ease of reaching someone in an emergency? (if applies) | 75% |
| How clearly your test and laboratory results were reviewed and explained? | 80% |
| Courtesy of the provider you saw? | 92% |
| Recommend to your family and friends? (% yes) | 82% |

**Table 4.** Factors Associated with Physical Functioning

| Predictor Variables | P value |
|---|---|
| **Demographics** | |
| Age, years | .000 |
| ≤ High School vs. > High School | .001 |
| < 2 or ≥ 2 Comorbidities | .000 |
| Female vs. Male | .026 |
| **Diabetes-related** | |
| Type 1 vs. Type 2 | .017 |
| Years with diabetes | .011 |
| **Clinician Type** | |
| Primary Care vs. Specialist | .018 |
| **Process Indicators** | |
| Patient checks blood sugar at least twice daily | .015 |
| Provider monitored kidney function | .014 |
| Patient had a dilated eye exam in the past year | .059 |
| Patient examines own feet daily | .093 |
| Provider documented weight or body mass index in report year | .188 |
| Provider discussed the importance of exercise in the past year | .202 |
| Provider did a foot exam in the past year | .207 |
| Provider documented a lipid profile in the report year | .245 |
| Provider discussed how to adjust eating habits in the past year | .265 |
| Dietician talked to patient in the past year | .394 |
| Provider documented at least two diabetes focused visits in past year | .689 |
| Provider documented an A1c test in report year | .699 |
| Provider instructed how to keep blood sugar near normal in the past year | .869 |
| Diabetes nurse educator talked to patient in the past year | .908 |

Model $R^2$=0.38, adjusted $R^2$=0.35, F(21, 430)=11.76, P<.001

Physical Component Summary score was significantly worse for study patients compared to normative scores for patients with type 2 diabetes. Harris also noted high rates of clinician adherence to optimal indicators of diabetes care with unsatisfactory health status and outcomes.[18] She hypothesized multiple reasons for the discordance, including intractability of diabetes to current therapies, patient self-care practices, physician medical care practices, and characteristics of US healthcare systems.

Tremendous opportunities exist for achieving optimal blood pressure and lipid levels, especially given the finding that most clinicians in our study were performing the tests. The difficulties in managing blood pressure, A1c, and lipid levels have been noted in the literature. "Intensive glycemic control and aggressive treatment of hypertension and dyslipidemia are particularly demanding in patients with type 2 diabetes; currently, many patients take at least six medications to manage the panoply of risk factors."[19] Most study patients with blood pressure and albumin values above target levels and nearly half of patients with lipid levels above target were on medications.

A 2003 World Health Organization (WHO) report[20] found that in a number of rigorous reviews, adherence to long-term therapies among patients suffering chronic disease averages only 50% in developed countries. In addition, poor adherence to long-term therapies severely compromises the effectiveness of treatment. Our study results seem consistent with these statements. The WHO Report noted 5 interacting dimensions of adherence: social and economic factors, the health care team/system, characteristics of the disease, disease therapies, and patient-related factors. While clinicians have made progress in following evidence-based recommendations, it clearly is not enough to achieve optimal outcomes.

Computerized tracking systems and electronic medical records are often mentioned as technology enhancements for improving diabetes care.[21,22] Future studies need to address how much information systems aimed at helping clinicians improve adherence to diabetes indirectly affect improved health status and outcomes. While electronic medical records may improve treatment efficiency, Van der Waal et al reported that patients give a higher ranking to continuity of care and a lower ranking to efficiency when comparing patient and medical specialists' preferences in aspects of health care quality.[23] In addition, lower education level, having state-regulated health insurance, and being older were associated with a higher preference for continuity. Hunt and Arar also reported on strongly discrepant patient and provider perceptions of long-term enactment of self-care chronic illness regimens.[24] They found that providers' goals, strategies, and evaluations were grounded in a clinical context and patients already knew what needed to be done and were quite motivated to do it. The impracticality of the clinical recommendations, especially for people with limited economic and social power, made it rare for patients to be able to fully follow the recommended treatment regimens. Effectiveness of newer strategies to improve professional performance such as centralized supervision or regulation of quality improvement, or use of financial incentives may lead to better technical processes measurement but not necessarily optimal patient outcomes.

The WHO report contains the following health care team and system-related factors that may have a nega-

tive effect on adherence: poorly developed health services with inadequate or non-existent reimbursement by health insurance plans, poor medication distribution systems, lack of knowledge and training for health care providers on managing chronic diseases, overworked health care providers, lack of incentives and feedback on performance, short consultations, weak capacity of the system to educate patients and provide follow-up, inability to establish community support and self-management capacity, lack of knowledge on adherence, and effective interventions for improving it. Addressing these areas offers the next frontier for improving adherence to therapies and better health outcomes for patients with diabetes.

Our study has limitations. First, clinicians were not randomly selected. Therefore, these results may be better than clinicians on average because the participating clinicians may be more likely to have studied the *Guidelines* and implemented *Guidelines*-based care. Second, indicators and other information gathered from the patient survey are valid only to the extent that patients were accurate in their reporting. We attempted to prevent inaccuracies due to the wording of survey questions by making revisions following the pilot test. Third, the cross-sectional design of the study precludes statements about cause and effect. For example, the number of patients who were treated to goal cannot be determined for A1c. Fourth, adherence involves a working relationship between the clinician and the patient. In this study, it cannot be determined whether the low adherence on some of the processes of care, such as seeing a dietician or diabetes nurse educator in the past year, were due to adherence by clinicians, adherence by patients, or some combination of the two. Fifth, our study consisted of non-Hispanic white patients which may limit generalizability of findings to other populations.

**Appendix 1.** Diabetes Study Group Members

Members of the Wisconsin Medical Society's Medical Outcomes Research Project (MORP) Diabetes Study Group included:

Melissa Meredith, MD (Chair), Endocrinology, University of Wisconsin Medical School and UW Clinical Diabetes Center, Madison

Frederick Blancke, MD, Internal Medicine—Retired

Joe Blustein, MD, Ophthalmology, MetaStar, Madison

Mark Capriolo, MD, Internal Medicine, Woodland Clinic, Manitowoc

Jenny Camponeschi, MS, Division of Public Health, Madison

Cynthia P. Helstad, PhD, RN, Wisconsin Medical Society, Madison

Russell Hermus, MD, Family Practice, Dean Health Systems, Madison

David L. Nordstrom, PhD, MPH, Department of Family Medicine, University of Wisconsin Medical School, Madison

Geoffrey Priest, MD, Meriter Hospital, Medical Affairs Department, Madison

Patrick Remington, MD, University of Wisconsin Department of Population Health Services, Madison

Richard Reynertson, MD, Gundersen Lutheran Clinic, LaCrosse

Debbie Rickelman, RHIT, Wisconsin Medical Society, Madison

Paul Rock, MA, Wisconsin Medical Society, Madison

Peter Rumm, MD, MPH, Division of Public Health, Madison

Seth Udlis, MD, Mercury Marine Family Medical Center, Fond du Lac

Maureen C. Van Dinter, MS, RN, CPNP, FNP-C, Northeast Family Medical Center, University of Wisconsin Medical School, Madison

Susan Wiegmann, PhD, Wisconsin Medical Society, Madison

Pat Zapp, Division of Public Health, Madison

## ACKNOWLEDGMENTS

The Diabetes Study Group would like to thank the staff from the participating clinics for their assistance with this research project: Deb Brostrom and Kara Krahulik, Gundersen Lutheran Medical Foundation; Michele Benson, Mercury Marine Clinic; and Connie Trantow, University of Wisconsin Health-West Clinic.

Current Wisconsin Medical Society Research and Medical Education staff who assisted the Diabetes Study Group include Stephanie Taylor (Administrative Assistant); former staff included Michelle Homan, PhD (Research Specialist), David Salo (Administrative Assistant), and Angela Russell (Research Intern). Consultants included Jeff Douglas, PhD, Jennifer Dykema, and Faye Gohre.

This study was partially supported by grants from the state of Wisconsin's Department of Health and Family Services Diabetes Prevention and Control Program and the National Kidney Foundation of Wisconsin. Bristol-Myers Squibb, GlaxoSmithKline, John Deere and Company, Merck & Company, Mercury Marine, Novartis Pharmaceuticals, Pfizer, Inc., Roche Laboratories, Inc., and Takeda Pharmaceuticals provided unrestricted donations to support this work. The Henry A. and Irene S. Anderson Endowment, Gundersen Lutheran Medical Foundation, Physicians Insurance Company of Wisconsin, United Wisconsin Services Foundation, Inc., individual physicians, and county medical societies also supported this work.

The Wisconsin Medical Society Foundation contributed significant financial support in addition to obtaining outside donations to support the Medical Outcomes Research Project Diabetes Study.

The consent form, surveys and study protocol were approved by the Department of Health and Human Services Office for Human Research Protection, the University of Wisconsin Human Subjects Committee, and the Gundersen Lutheran Institutional Review Board.

## REFERENCES


1. The Wisconsin Diabetes Advisory Group. Essential Diabetes Mellitus Care Guidelines. 1998.
2. 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;329:977-986.
3. UKPDS Group. Intensive blood-glucose control with sulfonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKDPS 33). *Lancet*. 1998;352:837-853.
4. The Wisconsin Collaborative Diabetes Quality Improvement Project. University of Wisconsin-Madison, Department of Population Health Sciences, Wisconsin Public Health & Health Policy Institute. 2002.
5. Blustein JN, Gold JA, Miesbauer KM, Halverson CL. Improving diabetes care for Medicare beneficiaries in outpatient setting: follow-up report. *WMJ*. 1998;March:62-66.
6. Oldridge N. Future directions: What paths do researchers need to take? What needs to be done to improve multi-level compliance? In: Burke LE, Ockene IS, eds. *Compliance in Healthcare and Research*. Armonk, NY: Futura; 2001:331-347.
7. Feder G, Griffiths C, Highton C, Eldridge S, Spence M, Southgate L. Do clinical practice guidelines introduced with practice based education improve care of asthmatic and diabetic patients? a randomized controlled trial in general practices in east London. *BMJ*. 1995;311:1473-1478.
8. Helstad CP, Meredith M. The State Medical Society of Wisconsin Medical Outcomes Research Project Diabetes Study. *WMJ*. 2001;100:19-21.
9. Personal Characteristics Form. StratisHealth formerly Health Outcomes Institute, Bloomington, MN.
10. Wallman K, Evinger S, Schechter S. Symposium: Race/Ethnicity and the 2000 Census. Measuring Our Nation's Diversity: Developing a Common Language for Data on Race/Ethnicity. *Am J Pub Health*. 2000;90:1704-1708.
11. Health Conditions Form. StratisHealth formerly Health Outcomes Institute, Bloomington, MN.
12. SF-36 Health Status Survey, Medical Outcomes Trust. Boston. 1992.
13. Ware JE, Kosinski M, Keller SD. *SF-36 Physical and Mental Health Summary Scales: A User's Manual*. Boston, MA: The Health Institute. 1994.
14. American Diabetes Association Patient Survey. Centers for Medicare and Medicaid Services, the Foundation for Accountability, the ADA and the National Committee for Quality Assurance, former Health Care Financing Administration. 1999.
15. Caruso LB, Silliman RA, Demissie SD, Greenfield S, Wagner EH. What can we do to improve physical function in older persons with type 2 diabetes? *J Gerontol*. 2000;55A:M372-M377.
16. Wisconsin Collaborative for Healthcare Quality. 2003 Performance and Progress Report.
17. Nissen SE, Tuzcu EM, Schoenhagen P, et al. Effect of intensive compared with moderate lipid-lowering therapy on progression of coronary atherosclerosis. *JAMA*. 2004;291:1071-1080.
18. Harris MI. Health care and health status and outcomes for patients with type 2 diabetes. *Diabetes Care*. 2000;23:754-758.
19. Nathan DM. Initial management of glycemia in type 2 diabetes mellitus. *N Engl J Med*. 2002;347:1342-1349.
20. World Health Organization. Adherence to Long-term Therapies: Evidence for Action. 2003.
21. Nuckolls JG. Process improvement approach to the care of patients with type 2 diabetes: Providing physicians with tools to increase compliance and improve outcomes. Type 2 Diabetes Management: A Post-Graduate Medicine Special Report. 2003;53-61.
22. Kirkman MS, Williams SR, Caffrey HH, Marrero DG. Impact of a program to improve adherence to diabetes guidelines by primary care physicians. *Diabetes Care*. 2002;25:1946-1951.
23. Van der Waal MA, Casparie AF, Lako CJ. Quality of care: a comparison of preferences between medical specialists and patients with chronic diseases. *Soc Sci Med*. 1996;42:643-649.
24. Hunt LM, Arar NH. An analytical framework for contrasting patient and provider views of the process of disease management. Med Anthropol Q. 2001;15:347-367.

# Wisconsin Medical Journal

The mission of the *Wisconsin Medical Journal* is to provide a vehicle for professional communication and continuing education of Wisconsin physicians.

The *Wisconsin Medical Journal* (ISSN 1098-1861) is the official publication of the Wisconsin Medical Society and is devoted to the interests of the medical profession and health care in Wisconsin. The managing editor is responsible for overseeing the production, business operation and contents of *Wisconsin Medical Journal*. The editorial board, chaired by the medical editor, solicits and peer reviews all scientific articles; it does not screen public health, socioeconomic or organizational articles. Although letters to the editor are reviewed by the medical editor, all signed expressions of opinion belong to the author(s) for which neither the *Wisconsin Medical Journal* nor the Society take responsibility. The *Wisconsin Medical Journal* is indexed in Index Medicus, Hospital Literature Index and Cambridge Scientific Abstracts.

For reprints of this article, contact the *Wisconsin Medical Journal* at 866.442.3800 or e-mail wmj@wismed.org.