

Barriers to Providing Diabetes Care in Community Health Centers

MARSHALL H. CHIN, MD, MPH
SANDY COOK, PHD
LEI JIN, MA
MELINDA L. DRUM, PHD
JAMES F. HARRISON, MD
JULIE KOPPERS, RNC, BSN, CDE

FAY THIEL
ANITA G. HARRAND, MS, RN, FNP
CYNTHIA T. SCHAEFER, RN, CS
HERBERT T. TAKASHIMA, MD, PHD, MPH
SIN-CHING CHIU, MD

OBJECTIVE — We aimed to identify barriers to improving care for individuals with diabetes in community health centers. These findings are important because many such patients, as in most other practice settings, receive care that does not meet evidence-based standards.

RESEARCH DESIGN AND METHODS — In 42 Midwestern health centers, we surveyed 389 health providers and administrators about the barriers they faced delivering diabetes care. We report on home blood glucose monitoring, HbA_{1c} tests, dilated eye examinations, foot examinations, diet, and exercise, all of which are a subset of the larger clinical practice recommendations of the American Diabetes Association (ADA).

RESULTS — Among the 279 (72%) respondents, providers perceived that patients were significantly less likely than providers to believe that key processes of care were important (overall mean on 30-point scale: providers 26.8, patients 18.2, $P = 0.0001$). Providers were more confident in their ability to instruct patients on diet and exercise than on their ability to help them make changes in these areas. Ratings of the importance of access to care and finances as barriers varied widely; however, >25% of the providers and administrators agreed that significant barriers included affordability of home blood glucose monitoring, HbA_{1c} testing, dilated eye examination, and special diets; nonproximity of ophthalmologist; forgetting to order eye examinations and to examine patients' feet; time required to teach home blood glucose monitoring; and language or cultural barriers.

CONCLUSIONS — Providers in health centers indicate a need to enhance behavioral change in diabetic patients. In addition, better health care delivery systems and reforms that improve the affordability, accessibility, and efficiency of care are also likely to help health centers meet ADA standards of care.

Diabetes Care 24:268–274, 2001

Access to quality health care remains a pressing problem for the ~43 million Americans who either have no medical insurance or who are otherwise medically underserved. The defeat of President Clin-

ton's health plan makes major governmental national health care reform unlikely, and issues of access to care and equity have not been priorities in the private managed-care movement. Thus, many vulnerable patients

in both urban and rural areas must rely on a safety net system of care. The emergency department, unfortunately, has historically served as the main source of care for many patients. Much morbidity could be prevented, however, if an efficient system of primary care existed for patients in medically underserved areas (1). To this end, in 1965, the federal government funded neighborhood health centers that were later codified as community, migrant, and homeless health centers through section 330 of the Public Health Service Act (2). The ~1,000 current federally supported health centers are an important source of primary care for 11 million medically underserved Americans (3).

Although many investigators have examined basic access to care, much less research has explored the quality of care provided to the medically underserved. In particular, relatively little research has studied the quality of chronic disease management in rural and urban health centers (1,4,5). With the aging of the population, chronic disease is more prevalent. Thus, managing vulnerable patients with chronic disease longitudinally in the outpatient setting is one of the most fundamental and difficult challenges for health centers and, indeed, for much of primary care.

Diabetes is a model illness for improving chronic disease management among vulnerable patients. Diabetes affects 10 million patients, costs ~\$100 billion annually, and causes significant complications including retinopathy, nephropathy, neuropathy, and cardiovascular disease (6). Moreover, African-Americans and patients of lower socioeconomic status suffer more severe morbidity (7). Regarding treatment, good care, including tight glucose control and early screening for end-organ damage, can prevent severe complications (8). The challenge for diabetes care, however, is that treatment of this complex disease requires multiple key processes and resources involving both provider and patient (9). Glucose levels must be measured at home and treated with a combination of diet, exercise, and medications. Retinal screening, foot examination, and coordination of care with specialists are necessary, as are checking for early signs of renal, vascular, and neuropathic disease. In addition, screening and treatment for other

From the Departments of Medicine and Health Studies (M.H.C., S.C., L.J., M.L.D.), Diabetes Research and Training Center, the University of Chicago, Chicago, Illinois; the North Woods Community Health Center (J.F.H.), Minong, Wisconsin; the MidWest Clinicians' Network (J.K., F.T.), Kenton, Ohio, and Okemos, Michigan; the Hamilton Family Medical Center (A.G.H.), Flint, and the Family Medical Center (S.-C.C.), Temperance, Michigan; the ECHO Health Center (C.T.S.), Evansville, Indiana; and the Health Resources and Services Administration Field Office (H.T.T.), Kansas City, Missouri.

Address correspondence and reprint requests to Marshall H. Chin, MD, MPH, University of Chicago, Section of General Internal Medicine, 5841 S. Maryland Ave., MC 2007, Chicago, IL 60637. E-mail: mchin@medicine.bsd.uchicago.edu.

Received for publication 16 June 2000 and accepted in revised form 5 October 2000.

Abbreviations: ADA, American Diabetes Association; MWCN, MidWest Clinicians' Network.

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

cardiovascular risk factors such as hypertension, hyperlipidemia, and tobacco use are especially important in patients with diabetes. Education of the patient is essential, and, frequently, a multidisciplinary team including physician, nurse, pharmacist, dietitian, and health educator cares for the patient. Not surprisingly, the challenge of providing effective diabetes care has defied a simple solution. Several studies in diverse health care settings, including academic institutions (10), health maintenance organizations (11), health centers (5), the Indian Health Service (12), and Medicare providers (13), have documented a substantial proportion of care that does not meet evidence-based quality-of-care standards.

Moreover, although managed care organizations and integrated health care delivery systems have increasingly targeted diabetes for disease management programs, little work has focused on what types of interventions are likely to succeed among the poorest diabetic patients in clinics with limited resources. Clinics serving poor patients have special challenges that make it unlikely that the findings from diabetes outcomes research in more advantaged populations will be directly generalizable (14). First, these federally funded clinics have significantly fewer resources than the private sector. Second, their patients are impoverished and less educated. Third, many of these clinics, especially those located in rural settings, lack access to tightly integrated delivery systems. Fourth, the small size of these clinics limits the financial feasibility of creating full-time teams devoted solely to diabetes care. Thus, the clinical problems and managerial challenges of program implementation require fresh innovative approaches (15).

In addition, few studies have systematically identified the barriers health centers face in making system-wide changes to diabetes care. Therefore, to help guide future intervention efforts, we surveyed clinicians and administrators in health centers to determine what they perceived to be the most important barriers they face to providing quality care for their patients with diabetes.

RESEARCH DESIGN AND METHODS

Study population

The MidWest Clinicians' Network (MWCN) is a not-for-profit organization of 70 health centers serving indigent vulnerable patients

in 10 Midwestern states. In 1995, the clinicians at these health centers identified diabetes as their top priority condition for quality improvement. The MWCN then established a committee whose mission was to conduct credible meaningful research on health care access and delivery issues in special populations served by health centers. The research committee originally consisted of clinicians and administrators from the health centers, and it subsequently added collaborators from the University of Chicago Diabetes Research and Training Center and the United States Bureau of Primary Health Care. All of the health centers were invited to participate in the diabetes project, which consisted primarily of yearly chart audits of their patients with diabetes (5), surveys of their providers and administrators about barriers to care, dissemination of the practice guidelines of the American Diabetes Association (ADA) (9), and opportunities for involvement in future quality-improvement projects. The University of Chicago Institutional Review Board approved the study.

The research committee asked a representative group of 42 health center sites for the names and addresses of their health care providers (physicians, nurses, dietitians, etc.) who worked with patients with diabetes and key administrators to serve as the population for the survey. The committee received the names of 419 individuals, although their specific role in the health center was not identified at this time.

Data collection

Provider Barriers Survey. The research committee developed a Provider Barriers Survey after a focus group discussion with providers at the 1997 MWCN annual meeting. Providers were asked to define what they felt were the primary barriers to quality diabetes care. The research committee then supplemented the providers' opinions with a review of the literature and its own experience to create a 51-item survey. The survey focused on the following six key processes of care as quality markers, selected from a much larger number of ADA standards (9): regular performance of home glucose monitoring, HbA_{1c} tests, dilated eye examinations, foot examinations, close monitoring of diet, and exercise. The conceptual domains of the survey, each addressing the six quality markers, were the importance of the various quality markers to providers, the importance of these quality markers to patients as perceived by providers, provider barriers to

care such as time constraints, patient barriers to care such as affordability of eye exams or access to care, providers' assessments of their personal responsibilities, and providers' confidence in performing and facilitating quality markers. Each question was rated on a 5-point Likert-type scale (1 = strongly disagree, 3 = neither agree nor disagree, 5 = strongly agree; importance, confidence items: 1 = not at all, 3 = somewhat, 5 = extremely). The research committee mailed the questionnaire to the 419 providers and administrators identified by the health centers as being responsible for adult patients with diabetes. Nonrespondents were sent two follow-up surveys.

Scale development. As a preliminary step to data analysis, the researchers defined and evaluated summary scales for selected conceptual domains in the provider survey, producing overall measures that included importance of processes of care to providers and to patients, provider responsibility, provider confidence, and patient barriers related to cost and ability. Reliability analysis indicated good internal consistency of the scales (Cronbach's α : 0.70–0.92) (16). Both summary scales and individual items were used in subsequent analyses and are listed in the APPENDIX.

Organizational survey. A team leader at each health center filled out a survey about its organizational characteristics, such as number of patients and urban/rural status.

Statistical analysis

The statistical analysis has the following two major components: a descriptive summary of individual survey responses and regression modeling to compare selected survey items and scales. In the regression models, the unit of analysis is respondent, nested within each health center. To incorporate correlation between respondents in the same health center, we used hierarchical regression (17–19). For responses that were approximately normally distributed, we fit linear mixed models with health center as a random effect, using the SAS MIXED procedure. Variables that satisfied this criterion were paired differences between two survey items (e.g., the difference in providers' ratings of importance of dilated eye examinations to themselves and to patients). The remaining responses were analyzed as ordinal outcomes, because their distributions were discrete and/or skewed and were not amenable to transformation to normality. Provider survey scales, described above, were divided into a smaller number of

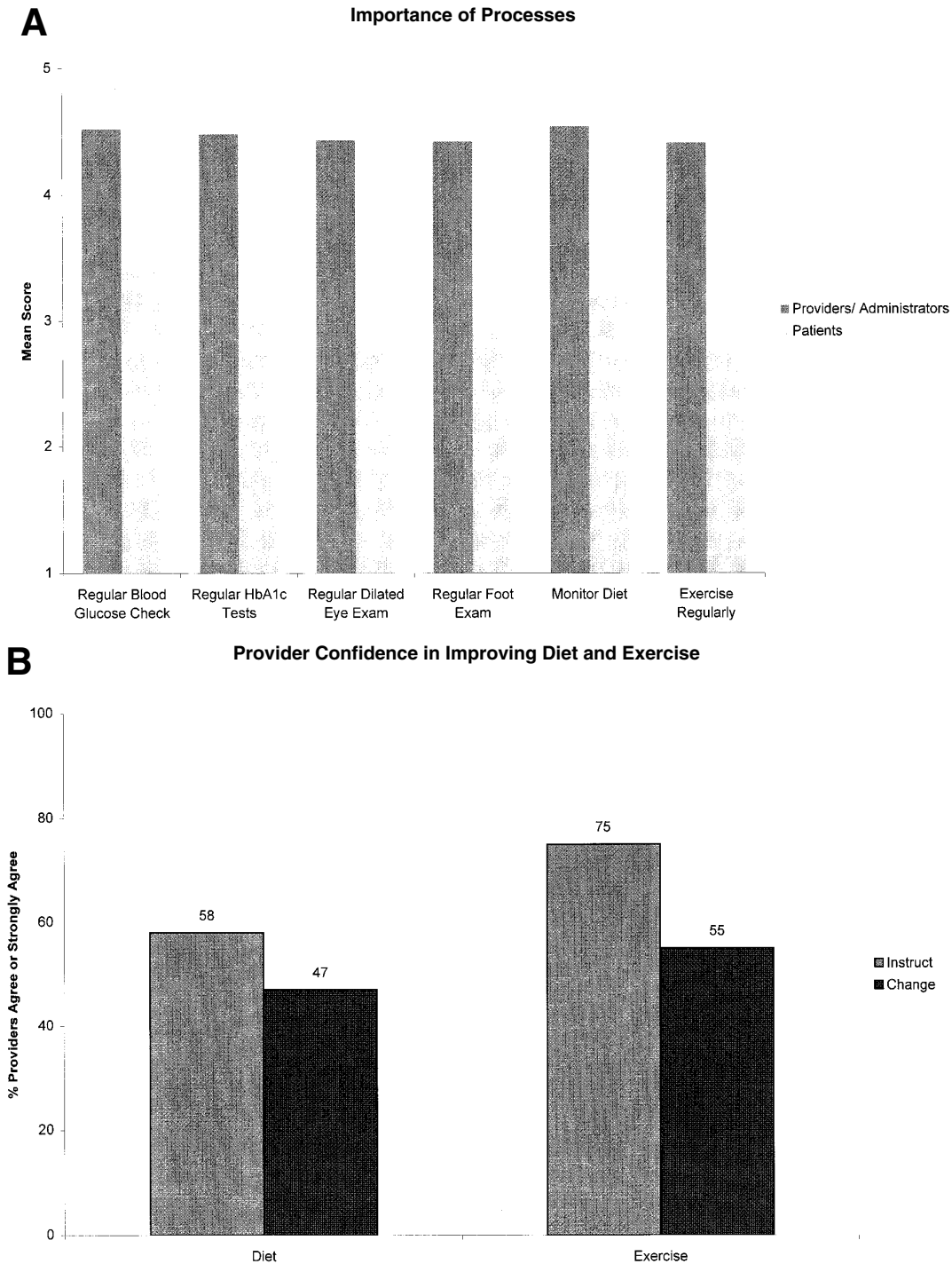


Figure 1—Respondents' opinions of behavioral barriers to improving diabetes care. A represents how important it was to providers and administrators that their patients with diabetes have specific processes of care performed, as well as the providers and administrators' perception of how important it was to their patients with diabetes to have the specific processes of care performed. Differences for each process of care were significant at $P < 0.001$. Questions were rated on a 1–5 scale (1 = not at all, 2 = not very, 3 = somewhat, 4 = very, 5 = extremely). B represents provider confidence in improving diet and exercise. Instruct = confidence in ability to instruct patient; Change = confidence in ability to facilitate behavioral change in patient.

ordered categories corresponding as nearly as possible to the original Likert-type scale to ease interpretation. For these outcomes, we used the SAS NLMIXED procedure to fit

ordinal probit models, again with health center as a random effect. In the interest of brevity, results of the ordinal analyses are reported as predicted probabilities in the

two highest ordered categories. In all cases, comparisons in terms of these categories convey the same qualitative information as the fitted probabilities for all categories.

As stated previously, we calculated summary scales on some conceptual domains and examined individual items on others, as appropriate. Results will be presented accordingly. In addition, some of the questions were only relevant to providers (physicians, other patient care providers) who had direct care with patients. Other questions were relevant to all respondents, including administrators. Hereafter, "respondents" will refer to all respondents, including administrators and others, and "providers" will refer to physicians and other patient care providers. Results accompanied by significance levels are based on the hierarchical models described previously, and the summary statistics (means, SDs, and proportions) are model-based estimates. Other results are descriptive frequencies.

RESULTS

Provider Barriers Survey

Our total sample size was 389 after excluding those who were no longer employed at the health center or did not have adult patients with diabetes ($n = 30$). We received 279 (72%) surveys from 42 health centers (100% of centers surveyed). The respondents consisted of 87 physicians, 108 other patient care providers, 9 dietitians, and 75 others (administrators, health educators, dentists, etc.). The median number of respondents per center was five, with an interquartile range of four to eight. Responses to the questions across the three mailings of the survey were generally the same. The pattern of similar responses across survey waves suggests low nonrespondent bias (20).

Respondents indicated that all diabetes processes of care surveyed were very or extremely important, namely, HbA_{1c} and blood glucose testing, dilated eye examinations, foot examinations, diet, and exercise. However, respondents perceived that patients would rate the importance of these processes significantly lower (i.e., only somewhat to very important) (Fig. 1A). On the 30-point scale incorporating all six processes, respondents' mean ratings were 26.8 for themselves and 18.2 for patients ($P < 0.0001$, SE difference of means = 0.27). Higher scores indicate greater importance; a score of 18 corresponds to an average response over items of "somewhat important." All individual items contributed significantly to the overall difference at $P < 0.0001$.

Providers gave a high rating for their responsibility for conducting these processes

of care. Except for dilated eye exams, for which 89% of physicians rated themselves only somewhat able or lower, providers were generally confident in their ability to perform these processes. Providers were more confident in their ability to instruct patients on diet and exercise (Fig. 1B) than on their ability to help them make changes in these areas (two 2-item scales: instruct, facilitate change; means = 7.6 and 7.0, respectively [6 = "neither agree nor disagree"]; SE difference of means = 0.08; $P = 0.0001$). Approximately 40% of providers perceived that patients are unable to follow a diet or exercise regularly.

Respondents rated affordability to be more of a barrier for home glucose monitoring and dilated eye examinations than for HbA_{1c} testing, diet, and exercise (Fig. 2A). Most respondents did not rate lack of a nearby laboratory, ophthalmologist, and nutritionist to be barriers (agree or strongly agree: 2, 26, and 18%, respectively; disagree or strongly disagree: 92, 65, and 76%, respectively). Approximately one-quarter of providers agreed that forgetting to order eye examinations and examine patients' feet were barriers and that teaching patients home glucose monitoring was too time-consuming (Fig. 2B). Providers frequently believed that language or cultural differences hindered patient education.

Provider Barriers Survey and organizational characteristics

In general, the barriers to quality of care did not vary by organizational characteristics, although some differences were observed between rural and urban settings and by size of patient population. Specifically, providers in urban health centers were more likely to report language and cultural barriers (agree or strongly agree: urban 55%, rural 32%, $P = 0.004$); they also tended to report greater confidence in dealing with such barriers (very to extremely confident: urban 42%, rural 26%, $P = 0.03$). Larger health centers (>3,500 patients) were half as likely to report lack of an ophthalmologist to examine patients as a barrier, although this effect does not reach statistical significance (agree or strongly agree: large 15%, medium 29%, small 31%; large vs. medium, $P = 0.08$; large vs. small, $P = 0.11$).

CONCLUSIONS — Analysis of providers' perceptions of barriers to care in health centers suggests that interventions should focus on patient education, training of physicians and other patient care

providers in behavioral change, redesign of local systems of delivering care, and efforts to improve structural and financial access to care. Quite striking was the discordance between the importance respondents placed on major processes of diabetes care and their perception that patients did not value them as highly. These attitudes, if truly present, could make provider-patient communication efforts more difficult and jeopardize patients' ability to adhere to self-care regimens. Thus, judging from providers' responses, educational and behavioral interventions for patients may be critical. Skills in motivating behavioral change are essential for effective clinical care, including diabetes management. Additional methods of patient behavioral change, such as empowering patients and training providers in communication techniques, may be useful (21,22).

Providers and administrators rated access to care, affordability of care, and sufficient appointment time as mild to moderate barriers to quality diabetes treatment in the health centers, although a significant proportion of respondents reported that some of these issues were major problems. Redesign of the delivery of care would be an important strategy for quality improvement in health centers where important barriers exist. For example, some systems of diabetes management have information systems and care pathways that minimize the chance that providers could forget to order dilated eye examinations or examine feet. Some systems use a team approach to educate the patient on issues such as home blood glucose monitoring, thus lessening the time burden on individual providers.

Most generally, obstacles to improving diabetes care have been conceptualized as the problems of changing human behavior and creating environments conducive to quality improvement. In surveys, primary care physicians frequently report difficulties with patients' motivation and understanding of diabetes, dietary and medication nonadherence, and weight control (23–25). Other barriers included inadequate reimbursement, insufficient time, and lack of support personnel outside of the office (25). A study of 22 primary care providers in a suburban managed care medical group found that physicians who saw more patients per unit time were less likely to perform screening tests for their diabetic patients. Specifically, they were less likely to order HDL cholesterol tests, screen for proteinuria, or refer to an ophthalmologist (26).

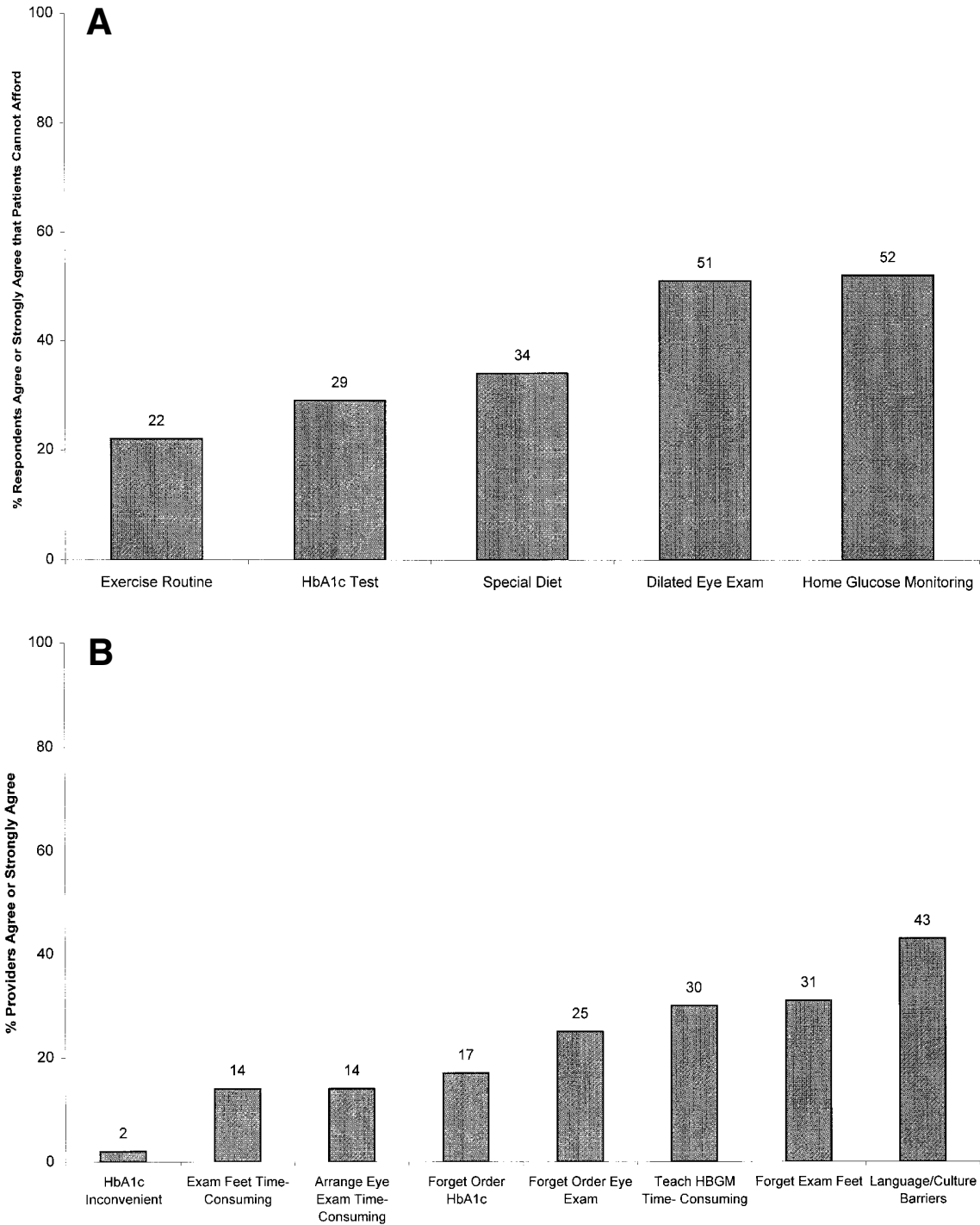


Figure 2—Respondents' opinions of affordability (A) and practice pattern barriers (B). HBGM, home blood glucose monitoring.

Many challenges are probably more severe in the health center setting because these clinics have fewer resources and more needy populations. A survey and interview of 31 primary care physicians in Texas working in health centers revealed that the doctors rated diabetes as harder to treat

than hypertension and angina (27). Reasons for the difficulty included the complexity of treatment, challenge of lifestyle change, time, expense, and discrepancy between provider and patient perceptions. Despite these challenges, the quality of diabetes care in health centers is similar to that

in hospital outpatient clinics and physicians' offices (5).

Our study has several limitations. Even though our survey response rate was relatively high for a provider questionnaire and the pattern of results was similar across the three waves of the survey (20,28), nonre-

spontaneous bias is still possible. In addition, some health centers did not participate in the wider diabetes quality-improvement project and, thus, were not surveyed. Moreover, we asked providers about their perception of patient ratings of the importance of processes of diabetes care, but did not confirm these assessments by surveying patients as well. Nonetheless, our study is one of the largest to examine the barriers to diabetes management among medically underserved patients in health centers.

Diabetes care is complex because it involves both self-care by the patient and the administration of key processes of care by the provider. Quality improvement of diabetes care in health centers probably requires a multifactorial approach emphasizing patient education, improved training in behavioral change for providers, and enhanced delivery systems (5). For a significant number of individuals, systematic reforms that decrease the cost of care to patients and enhance access to providers are also likely to be of benefit. Such interventions will require leadership, the creation of quality improvement infrastructure, behavioral and cultural change by both patients and providers, and resources. Based on a review of their prior diabetes care and the results of this barriers survey (5), health centers in the MWCN are currently implementing and evaluating multifactorial interventions targeted at the health center, provider, and patient levels to improve diabetes care. In addition, the Bureau of Primary Health Care and Centers for Disease Control Diabetes Control Programs are sponsoring a national Diabetes Collaborative Breakthrough Series that seeks to improve the quality of care and health outcomes in hundreds of health centers through the use of a chronic care model (15) and rapid Plan-Do-Study-Act cycles derived from the continuous quality improvement field (29).

Acknowledgments— This study was supported by grants from the Agency for Healthcare Research and Quality and Bureau of Primary Health Care (CSH501328-11-3, CSH501328-12-2, CSH501328-13-3, AHRQ R01 HS10479-01), Centers for Disease Control (CSH501328-13-2), and the National Institute of Diabetes and Digestive and Kidney Diseases Diabetes Research and Training Center (P60 DK20595). M.H.C. was supported by a National Institute on Aging Geriatric Academic Program Award (5-K12-AG-00488) and is a Robert Wood Johnson Foundation Generalist Physician Faculty Scholar.

APPENDIX — Survey Summary Scales and Individual Items

| | |
|--|--------------|
| Importance of processes of care (medical, diet, exercise) | |
| • To provider | 6-item total |
| • To patient, as perceived by provider | 6-item total |
| Patient barriers | |
| • Patient ability to follow diet/exercise | 2-item total |
| • Patient ability to do home glucose monitoring | 1 item |
| • Home glucose monitoring too painful | 1 item |
| • Affordability: diet/exercise | 2-item total |
| • Affordability: home glucose, HbA _{1c} , dilated eye exam | 3-item total |
| • Availability: lab for glycosylated hemoglobin test | 1 item |
| • Availability: ophthalmologist | 1 item |
| • Availability: nutritionist | 1 item |
| Provider responsibility | |
| • Medical processes/referrals* | 3-item total |
| • Instruction on diet/exercise | 2-item total |
| Provider barriers | |
| • Forget: HbA _{1c} test, dilated eye exam referral, foot exam | 3-item total |
| • Time consuming: teaching home blood glucose monitoring | 1 item |
| • Time consuming: foot examination | 1 item |
| • Time consuming: ophthalmology referral | 1 item |
| • Inconvenient: HbA _{1c} test | 1 item |
| • Language/cultural differences hinder patient education | 1 item |
| Provider confidence | |
| • Medical processes† | 3 items |
| • Instruct in diet/exercise | 2 items |
| • Facilitate change in diet/exercise | 2 items |
| • Communicate with patients with language/cultural differences | 1 item |
| Importance of documentation (test and examination results/instruction) | 6 items |

*Medical processes/referrals: home glucose monitoring, foot examination, referral for dilated eye exam;
†medical processes: home glucose monitoring, foot examination, dilated eye exam.

We would like to acknowledge the dedication and collaboration of the health center sites participating in the MWCN diabetes quality improvement project.

This study was presented in part at the annual meetings of the American Diabetes Association, 10–12 June 2000, San Antonio, TX; Society of General Internal Medicine, 29 April 1999, San Francisco, CA; and Midwest Society of General Internal Medicine, 17 September 1999, Chicago, IL.

References

- Starfield B, Powe NR, Weiner JR, Stuart M, Steinwachs D, Scholle SH, Gerstenberger A: Costs vs. quality in different types of primary care settings. *JAMA* 272:1903–1908, 1994
- Lelkowitz B, Todd J: An overview: health centers at the crossroads. *J Ambulatory Care Management* 22:1–12, 1999
- http://www.nachc.com/About_Centers/frame/about_chcs.htm. America's Health Centers. Accessed 19 December 2000
- Blumenthal D, Mort E, Edwards J: The efficacy of primary care for vulnerable population groups. *Health Serv Res* 30:253–273, 1995
- Chin MH, Auerbach SB, Cook S, Harrison JF, Koppert J, Jin L, Thiel F, Karrison TG, Harrand AG, Schaefer CT, Takashima HT, Egbert N, Chiu SC, McNabb WL: Quality of diabetes care in community health centers. *Am J Public Health* 90:431–434, 2000
- American Diabetes Association: Economic consequences of diabetes mellitus in the U.S. in 1997. *Diabetes Care* 21:296–309, 1998
- Harris MI, Cowie CC, Stern MP, Boyko EJ, Reiber GE, Bennett PH (Eds.): *Diabetes in America*. 2nd ed. Washington, DC, U.S. Govt. Printing Office, 1995, p. 259–282, 613–629 (NIH publ. no. 95–1468)
- U.K. Prospective Diabetes Study 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* 352:837–853, 1998
- American Diabetes Association: Clinical practice recommendations 2000. *Diabetes Care* 23 (Suppl. 1):S1–S116, 2000
- Miller KL, Hirsch IB: Physicians' practices in screening for the development of diabetic nephropathy and the use of glycosylated hemoglobin levels. *Diabetes Care* 17: 1495–1497, 1994

11. Peters AL, Legorreta AP, Ossorio RC, Davidson MB: Quality of outpatient care provided to diabetic patients: a health maintenance organization experience. *Diabetes Care* 19:601–606, 1996
12. Mayfield JA, Rith-Najarian SJ, Acton KH, Schraer CD, Stahn RM, Johnson MH, Gohdes D: Assessment of diabetes care by medical record review: the Indian Health Service model. *Diabetes Care* 17:918–923, 1994
13. 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
14. Walker EA, Wylie-Rosett J, Shamooh H, Engel S, Basch CE, Zybert P, Cypress M: Program development to prevent complications of diabetes: assessment of barriers in an urban clinic. *Diabetes Care* 18:1291–1293, 1995
15. Wagner EH, Austin BT, Von Korff M: Organizing care for patients with chronic illness. *Milbank Q* 74:511–544, 1996
16. Cronbach LJ: Coefficient alpha and the internal structure of tests. *Psychometrika* 16: 297–334, 1951
17. Bryk AS, Raudenbush SW: *Hierarchical Linear Models: Applications and Data Analysis Methods*. Newbury Park, CA, Sage, 1992
18. Harville DA: Maximum likelihood approaches to variance component estimation and to related problems. *J Am Stat Assoc* 72:320–338, 1977
19. Lindstrom MJ, Bates DM: Nonlinear mixed effects models for repeated measures data. *Biometrics* 46:673–687, 1990
20. Sheikh H, Mattingly S: Investigating non-response in mail surveys. *J Epidemiol Community Health* 35:293–296, 1981
21. Greenfield S, Kaplan SH, Ware JE Jr, Yano EM, Frank HJL: Patients' participation in medical care: effects on blood sugar control and quality of life in diabetes. *J Gen Intern Med* 3:448–457, 1988
22. Anderson RM, Funnell MM, Barr PA, Dedrick RF, Davis WK: Learning to empower patients: results of a randomized controlled trial. *Diabetes Care* 18:943–949, 1995
23. Jacques CHM, Jones RL: Problems encountered by primary care physicians in the care of patients with diabetes. *Arch Fam Med* 2:739–741, 1993
24. Dalewitz J, Khan N, Hershey CO: Barriers to control of blood glucose in diabetes mellitus. *Am J Med Quality* 15:16–25, 2000
25. Drass J, Kell S, Osborn M, Bausell B, Corcoran J Jr, Moskowitz A, Fleming B: Diabetes care for Medicare beneficiaries: attitudes and behaviors of primary care physicians. *Diabetes Care* 21:1282–1287, 1998
26. Streja DA, Rabkin SW: Factors associated with implementation of preventive care measures in patients with diabetes mellitus. *Arch Intern Med* 159:294–302, 1999
27. Larne AC, Pugh JA: Attitudes of primary care providers towards diabetes: barriers to guideline implementation. *Diabetes Care* 21:1391–1396, 1998
28. Asch DA, Jedrzewski MK, Christakis NA: Response rates to mail surveys published in medical journals. *J Clin Epidemiol* 50:1129–1136, 1997
29. Berwick DM: Continuous improvement as an ideal in health care. *N Engl J Med* 320: 53–56, 1989