

Recommendations for Healthcare System and Self-Management Education Interventions to Reduce Morbidity and Mortality from Diabetes

Task Force on Community Preventive Services

Medical Subject Headings (MeSH): diabetes mellitus, delivery of health care, health education, community health services, decision making, evidence-based medicine, preventive health services, public health practice, review literature (Am J Prev Med 2002;22(4S): 10–14) © 2002 American Journal of Preventive Medicine

Introduction

Diabetes mellitus (diabetes) is a prevalent, costly condition that causes significant morbidity and mortality. In the United States, an estimated 15.7 million people (5.9% of the total population) have diabetes,¹ of whom 5.4 million are undiagnosed. In 1997 alone, 789,000 new cases were diagnosed.¹ Moreover, according to 1996 death certificates, diabetes is the seventh leading cause of death in the United States.¹ The costs of diabetes to the American health-care system are enormous, with total (direct and indirect) costs estimated at \$98 billion in 1997.²

Reducing morbidity and mortality and improving quality of life for people with diabetes is a major public health objective. As part of the *Healthy People 2010* initiative,³ goals have been set to prevent diabetes, increase early diagnosis, improve rates of screening for its complications, and decrease morbidity and mortality. By implementing interventions shown to be effective, policymakers and healthcare providers can help their communities achieve these goals while using community resources efficiently.

The recommendations in this report represent the work of the Task Force on Community Preventive Services (the Task Force). An independent, nonfederal group, the Task Force is developing the *Guide to Community Preventive Services* (the *Community Guide*) with the support of the U.S. Department of Health and Human Services (DHHS), in collaboration with public and private partners. The Centers for Disease Control and Prevention (CDC) provides staff support to the Task Force for developing the *Community Guide*. The

recommendations presented in this report, however, do not necessarily represent the recommendations of the CDC or DHHS.

These systematic reviews focus on population-oriented strategies to improve the care of people with either type 1 or type 2 diabetes. (Type 1 diabetes results from cellular-mediated autoimmune destruction of the β cells of the pancreas, and type 2 is characterized by insulin resistance and relative insulin deficiency.⁴) The interventions reviewed were conducted both in health-care systems and in community settings.

Primary prevention is clearly the best way to avoid morbidity and mortality from diabetes. The best strategies for prevention of type 2 diabetes are weight control and adequate physical activity among people at high risk or with impaired glucose tolerance^{5,6}; these topics will be addressed in other reviews in the *Community Guide*. The *Community Guide* focuses on population-oriented approaches to improving health and minimizing disability and premature death, rather than the clinical care of individuals. Recommendations for clinical care of people with diabetes can be obtained from the American Diabetes Association (ADA),⁷ and screening recommendations are available from the U.S. Preventive Services Task Force.⁸

Intervention Recommendations

A group of consultants (see Acknowledgments) representing a broad spectrum of expertise selected two areas of focus for the initial systematic review of diabetes: healthcare system interventions to optimize care and diabetes self-management education (DSME) interventions in community settings. Each of these priority areas included several specific interventions.

The methods for conducting evidence reviews and translating the evidence of effectiveness into recommendations for the *Community Guide* have been published previously.⁹ Evidence of effectiveness is charac-

The names and affiliations of the Task Force members are listed in the front of this supplement and at www.thecommunityguide.org.

Address correspondence and reprint requests to: Susan L. Norris, MD, MPH, Division of Diabetes Translation, MS K-10, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 4770 Buford Hwy, Atlanta, GA 30341. E-mail: Scn5@cdc.gov

Table 1. Diabetes healthcare system interventions and self-management education: recommendations of the Task Force on Community Preventive Services

Intervention	Recommendation
Healthcare system	
Disease management	Strongly recommended
Case management	Strongly recommended
Self-management education	
In community gathering places	Recommended for adults with type 2 diabetes
In the home	Recommended for children and adolescents with type 1 diabetes <i>Insufficient evidence</i> to make a recommendation for people with type 2 diabetes
In camps	<i>Insufficient evidence</i>
At the worksite	<i>Insufficient evidence</i>
In schools	<i>Insufficient evidence</i>

The evidence on which these recommendations are based is described in detail in the accompanying articles.^{10,11} Primarily on the basis of the evidence of effectiveness found during a systematic review, the Task Force issues one of four recommendations for the use of each intervention. Those recommendations, and the corresponding evidence on which the recommendations are based, are: strongly recommended (strong evidence of effectiveness was found), recommended (sufficient evidence of effectiveness was found), insufficient evidence (available studies provided insufficient evidence to assess the effectiveness of the intervention), and not recommended (available studies provided sufficient evidence that the intervention is ineffective or that harms exceed benefits).

terized as *strong*, *sufficient*, or *insufficient* on the basis of the number of available studies, the suitability of study designs for evaluating effectiveness, the quality of execution of the studies, the consistency of the results, and the effect sizes.⁹ In the current review, a broad range of outcomes was examined, including the intermediate outcomes of knowledge and psychosocial mediators, as well as the more distal outcomes of lifestyle, short- and long-term health, and quality of life. The Task Force used lifestyle, health, and quality of life outcomes to formulate recommendations; knowledge and psychosocial mediators, however, are also important outcomes and were, therefore, included in the review.

A detailed description of the evidence for each intervention is provided by Norris et al.^{10,11} and on the *Community Guide* website (www.thecommunityguide.org). A summary of recommendations about the interventions reviewed is presented in Table 1.

Healthcare System Interventions

The Task Force reviewed two interventions to improve the performance of healthcare systems and providers delivering care to people with diabetes: disease management and case management. In the last decade, new systems of healthcare delivery such as these have emerged for many reasons: Traditional systems have failed to meet the needs of people with diabetes, population demographics have changed, new healthcare technology is continually emerging, more attention is being paid to quality of life and other patient-oriented outcomes, society demands the minimization of medical errors, and a desire exists to make the most of limited healthcare resources.

Disease management: strongly recommended. Disease management of diabetes in the clinical setting is an organized, proactive, multicomponent approach to healthcare delivery for all members of a population

with diabetes or for a subpopulation with specific health risk factors. It embraces all aspects of the delivery system. Care is focused on, and integrated across, the entire spectrum of the disease and its complications as well as the prevention of comorbid conditions. The goal is to improve short- and long-term health or economic outcomes, or both, in the entire population with diabetes. The essential components of disease management are (1) identification of individuals or populations with diabetes (or a subset with certain risk factors); (2) use of guidelines or performance standards to manage those identified; (3) information systems to track and monitor interventions and patient-, practice-, or population-based outcomes; and (4) measurement and management of patient and population outcomes. Other interventions may be incorporated into disease management interventions, and these interventions can be focused on (1) the healthcare system (e.g., practice redesign, electronic information systems, changes in models of care), (2) the provider (e.g., reminders, education, feedback, decision support), or (3) the patient or population (e.g., patient-centered care strategies, DSME, reminders, feedback, telephone call outreach).

Disease management is strongly recommended by the Task Force based on strong evidence of its effectiveness in improving glycemic control, provider monitoring of glycosylated hemoglobin (GHb), and screening for diabetic retinopathy. Sufficient evidence is also available of its effectiveness in improving provider screening of the lower extremities for neuropathy and vascular changes, urine screening for protein, and monitoring of lipid concentrations. This recommendation is applicable to adults with diabetes in the settings of managed care organizations and community clinics in the United States and Europe. Although a number of other important health outcomes were examined, including blood pressure and lipid concentrations, data

were insufficient to make recommendations based on these outcomes.

Case management: strongly recommended. Case management is “a set of activities whereby the needs of populations of patients at risk for excessive resource utilization, poor outcomes, or poor coordination of services are identified and addressed through improved planning, coordination, and provision of care.”¹² It usually involves the assignment of authority to a single professional (the case manager, most commonly a nurse) who is not a provider of direct health care. The essential features of case management are (1) the identification of eligible patients, (2) the assessment of individual patients’ needs, (3) development of an individual care plan, (4) implementation of that care plan, and (5) monitoring of outcomes. Case management is often combined with disease management but can also stand alone as an intervention or be combined with other clinical care interventions (e.g., practice guidelines or patient reminders).

Case management is strongly recommended by the Task Force based on strong evidence of its effectiveness in improving glycemic control. Evidence is also available of its effectiveness in improving provider monitoring of GHb, when case management is combined with disease management. These findings are applicable primarily in the U.S. managed care setting for adults with type 2 diabetes.

Diabetes Self-Management Education Interventions

The Task Force reviewed several interventions delivered in community settings to improve the self-management of people with diabetes or to increase the understanding of diabetes among coworkers or school personnel. DSME, the process of teaching people to manage their own diabetes,¹³ is considered by many to be “the cornerstone of care for all individuals with diabetes who want to achieve successful health-related outcomes.”¹⁴ The goals of diabetes education are to optimize metabolic control, prevent acute and chronic complications, and achieve an optimal quality of life, while keeping costs acceptable.¹⁵ One of the *Healthy People 2010* goals is to increase to 60% (from the 1998 baseline of 40%) the proportion of people with diabetes who receive formal diabetes education.³ Significant knowledge and skill deficits are found in 50% to 80% of people with diabetes,¹⁶ and levels of glycemia (as measured by GHb, which includes hemoglobin A1 [HbA1] and hemoglobin A1c [HbA1c], both formed nonenzymatically from hemoglobin and glucose¹⁷) are unacceptably high in both people with type 1¹⁸ and type 2 diabetes.¹⁹ DSME is provided in a variety of settings, including recreational camps, schools, the worksite, the home, and community gathering places. Although these interventions have some common char-

acteristics, target populations, providers, and content can differ, and, thus, we have defined them as separate interventions in this review.

Diabetes self-management education in community gathering places: recommended for adults with type 2 diabetes. In this intervention, DSME is provided to people aged 18 years or older in settings other than the home, clinic, school, or worksite (e.g., community centers, faith-based institutions, libraries, or private facilities such as residential cardiovascular risk-reduction centers). Community gathering places have been pursued because traditional clinical settings may not be ideal for DSME of adults, the home setting is conducive only to individual or family teaching, and education at the worksite does not reach those not working outside the home.

On the basis of *Community Guide* rules of evidence,⁹ the Task Force concluded that there is sufficient evidence of effectiveness in improving glycemic control to recommend DSME interventions in community gathering places for adults with type 2 diabetes. It should be noted, however, that these interventions were rarely coordinated with the patient’s clinical care provider, and the nature and extent of care in the clinical setting was unclear. DSME for adults with type 2 diabetes delivered in the setting of community gathering places should be coordinated with the person’s primary care provider, and these interventions are not meant to replace education delivered in the clinical setting.

Diabetes self-management education in the home: recommended for adolescents with type 1 diabetes; insufficient evidence for people with type 2 diabetes. The home can be a good setting for DSME interventions because the educator can address issues that can be more difficult to deal with in the clinical setting, such as cultural, family, and environmental factors affecting lifestyle, self-monitoring of blood glucose, and barriers to optimal self-care.

On the basis of *Community Guide* rules of evidence,⁹ there is sufficient evidence that DSME in the home is effective for improving glycemic control among adolescents with type 1 diabetes, whether using home visits or computer-assisted instruction. Too few studies were available to assess the effectiveness of DSME in the home for people with type 2 diabetes.

Diabetes self-management education in the camp setting: insufficient evidence. DSME in summer camps exposes children and adolescents with type 1 diabetes to intensive self-management education in a short-term recreational camp setting (usually 1 to 2 weeks). Summer camps, where education can be readily integrated into daily routines, have several advantages: medical treatment and compliance with educational programs can be optimized, food intake is controlled, physical activity can be pursued, and medical expertise is usually readily available.

The Task Force identified ten qualifying studies, all of adolescents with type 1 diabetes. An insufficient number of quality studies demonstrated positive effects on health outcomes, such as glycemic control. On the basis of *Community Guide* rules of evidence,⁹ the Task Force concluded there was insufficient evidence to recommend for or against this intervention because (1) only a few studies evaluated relevant health outcomes, (2) there were limitations in study design and execution, and (3) results were inconsistent.

Diabetes self-management education at the worksite: insufficient evidence. Worksite interventions can involve DSME, as well as education of coworkers or supervisors. Because workers spend a significant portion of their time at work, DSME at the worksite can improve access to health promotion efforts. Education of supervisors, managers, and coworkers about diabetes can create a supportive environment for self-management, while minimizing discrimination and preparing fellow employees to respond appropriately to diabetes-related emergencies.

On the basis of *Community Guide* rules of evidence,⁹ the Task Force concluded that evidence was insufficient to assess the effectiveness of this intervention, as there was only one qualifying study with design limitations.

Education of school personnel about diabetes: insufficient evidence. Educating teachers and other school professionals about diabetes can create a supportive environment for self-management, minimize disruption in educational routines attributable to diabetes, and allow school personnel to respond appropriately to diabetes-related emergencies. On the basis of *Community Guide* rules of evidence,⁹ the Task Force concluded that there was insufficient evidence to assess the effectiveness of this intervention.

Additional Reviews

The Task Force is currently reviewing the evidence of effectiveness of several additional healthcare system interventions related to the treatment of people with diabetes: provider and patient reminder and recall systems as well as telephone call outreach and telemedicine. In addition, reviews are planned to assess the effectiveness of family, public policy, and public service interventions in diabetes care. Completion and release of the Task Force evaluations and conclusions about these additional reviews are anticipated in 2003.

Interpreting and Using the Recommendations

Given the large public health burden of diabetes, improving care for people with diabetes is relevant to most communities. This report and other related publications provide guidance from the Task Force to a variety of important audiences, including personnel in

state and local health departments, managed care organizations, purchasers of health care, those responsible for funding public health programs, and others with an interest in, or responsibility for, improving the health and well-being of people with diabetes. In selecting and implementing interventions, communities should strive to develop a comprehensive strategy to manage people with diabetes, which includes improving glycemic control, blood pressure, and lipid concentrations; decreasing complications and mortality; and improving quality of life.

Choosing interventions that work in general and that are well matched to local culture, needs, and capabilities and then implementing those interventions well are vital steps for improving outcomes among people with diabetes. In setting priorities for interventions to meet local objectives, recommendations and other evidence provided in the *Community Guide* should be considered along with such local information as resource availability, administrative structures, and the cultural, economic, social, and regulatory environments of organizations and practitioners. Information about applicability can be used to assess the usefulness of an intervention in a particular setting or population. Although available studies are limited in number and variable in quality, economic information might be useful in identifying (1) resource requirements for interventions and (2) interventions that meet public health goals more efficiently than other available options. If local goals and resources permit, the use of strongly recommended and recommended interventions should be initiated or increased.

A starting point for communities and healthcare systems is to assess the current burden of diabetes in the community or organization, the level of care and education provided to residents with diabetes, and complication rates. Comparison can then be made to care guidelines and goals of treatment presented by organizations such as the ADA.⁷ Community approaches can then be developed to address health disparities and to optimize care and quality of life.

Finally, the associated reviews that led to these recommendations should be useful to researchers and scientific organizations to identify directions for future research. We should reiterate that a finding of insufficient evidence, resulting in no recommendation for some interventions, is not a conclusion that the intervention was ineffective but rather a reflection of the insufficient number of high-quality studies on which to base a conclusion. A finding of insufficient evidence, therefore, identifies areas in need of further research.

Acknowledgments

The Task Force acknowledges the following people for their extensive contributions to the preparation of this manuscript:

Susan L. Norris, MD, MPH, Phyllis J. Nichols, MPH, Kristi Riccio, BSc, Michael M. Engelgau, MD, MSc, Carl J. Caspersen, PhD, MPH, Leonard Jack Jr., PhD, Division of Diabetes Translation, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA; George Isham, MD, HealthPartners, Minneapolis, MN; Russell Glasgow, PhD, AMC Cancer Research Center, Denver, CO; Sanford Garfield, PhD, Diabetes Program Branch, National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, Bethesda, MD; David McCulloch, MD, Group Health Cooperative, Seattle, WA; Kate W. Harris, BA, Peter A. Briss, MD, Division of Prevention Research and Analytic Methods, Epidemiology Program Office, CDC, Atlanta, GA.

Consultants for this systematic review were Tanya Agurs-Collins, PhD, Howard University Cancer Center, Washington, DC; Ann Albright, PhD, RD, California Department of Health Services, Sacramento; Pam Allweiss, MD, Lexington, KY; Elizabeth Barrett-Connor, MD, University of California, San Diego; Richard Eastman, MD, Cygnus, San Francisco, CA; Luis Escobedo, MD, New Mexico Department of Health, Las Cruces; Wilfred Fujimoto, MD, University of Washington, Seattle; Richard Kahn, PhD, American Diabetes Association, Alexandria, VA; Robert Kaplan, PhD, University of California, San Diego; Shiriki Kumanyika, PhD, University of Pennsylvania, Philadelphia; David Marrero, PhD, Indiana University, Indianapolis; Marjorie Mau, MD, Honolulu, HI; Nicolaas Pronk, PhD, HealthPartners, Minneapolis, MN; Laverne Reid, PhD, MPH, North Carolina Central University, Durham; Yvette Roubideaux, MD, MPH, University of Arizona, Tucson.

We also thank the following people for assisting in abstracting data from the studies included in this review: Semra Aytur, MPH; Inkyung Baik, PhD; Holly Murphy MD, MPH; Cora Roelofs, ScD; Kelly Welch, BSc.

References

1. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. National diabetes fact sheet. 1998. Available at: www.cdc.gov/diabetes/pubs/facts98.htm. Accessed January 10, 2002.
2. American Diabetes Association. Economic consequences of diabetes mellitus in the U.S. in 1997. *Diabetes Care* 1998;21:296–309.
3. U.S. Department of Health and Human Services. Healthy People 2010, 2nd ed. Washington, DC: U.S. Government Printing Office; 2000.
4. Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care* 2001;24(suppl 1):S5–S20.
5. Pan XR, Li GW, Hu YH, et al. Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and Diabetes Study. *Diabetes Care* 1997;20:537–44.
6. Tuomilehto J, Lindstrom J, Eriksson JG, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med* 2001;344:1343–50.
7. American Diabetes Association. American Diabetes Association: clinical practice recommendations 2001. *Diabetes Care* 2001;24(suppl 1):S1–S133.
8. U.S. Preventive Services Task Force. Screening for diabetes mellitus. Guide to clinical preventive services. Alexandria, VA: International Medical Publishing, 1996:193–208.
9. Briss PA, Zaza S, Pappaioanou M, et al. Developing an evidence-based Guide to Community Preventive Services—methods. *The Task Force on Community Preventive Services. Am J Prev Med* 2000;18(suppl 1):35–43.
10. Norris SL, Nichols PJ, Caspersen C, et al., and the Task Force on Community Preventive Services. The effectiveness of disease and case management for people with diabetes: a systematic review. *Am J Prev Med* 2002;22(suppl 4):15–38.
11. Norris SL, Nichols PJ, Caspersen CJ, et al., and the Task Force on Community Preventive Services. Increasing diabetes self-management education in community settings: a systematic review. *Am J Prev Med* 2002;22(suppl 4):39–66.
12. Institute for Clinical Systems Integration. Technology assessment: care management for chronic illness, the frail elderly, and acute myocardial infarction. Bloomington, MN: Institute for Clinical Systems Integration (ICSI), 1998. Report no. 44.
13. Task Force to Revise the National Standards. National standards for diabetes self-management education programs. *Diabetes Educ* 1995;21:189–93.
14. Mensing C, Boucher J, Cypress M, et al. National standards for diabetes self-management education. *Diabetes Care* 2000;23:682–9.
15. de Weerd I, Visser AP, van der Veen EA. Attitude behaviour theories and diabetes education programmes. *Patient Educ Counsel* 1989;14:3–19.
16. Clement S. Diabetes self-management education. *Diabetes Care* 1995;18:1204–14.
17. American Diabetes Association. Tests of glycemia in diabetes. *Diabetes Care* 2001;24(suppl 1):S80–S82.
18. Rosilio M, Cotton JB, Wieliczko MC, et al. Factors associated with glycemic control. A cross-sectional nationwide study in 2,579 French children with type 1 diabetes. The French Pediatric Diabetes Group. *Diabetes Care* 1998;21:1146–53.
19. Harris MI. Health care and health status and outcomes for patients with type 2 diabetes. *Diabetes Care* 2000;23:754–8.

**Reprinted by permission of Elsevier Science from:
Recommendations for healthcare system and self-management education interventions to
reduce morbidity and mortality from diabetes. Task Force on Community Preventive
Services. , American Journal of Prevention Medicine. Vol 22 No 4S, pp 10-14.**