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CLINICAL GUIDELINE

Combined Diet and Physical Activity Promotion Programs for Prevention of Diabetes: Community Preventive Services Task Force Recommendation Statement

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Description: Community Preventive Services Task Force (Task Force) recommendation on the use of combined diet and physical activity promotion programs to reduce progression to type 2 diabetes in persons at increased risk.

Methods: The Task Force commissioned an evidence review that assessed the benefits and harms of programs to promote and support individual improvements in diet, exercise, and weight and supervised a review on the economic efficiency of these programs in clinical trial, primary care, and primary care–referable settings.

Population: Adolescents and adults at increased risk for progression to type 2 diabetes.

Recommendation: The Task Force recommends the use of combined diet and physical activity promotion programs by health care systems, communities, and other implementers to provide counseling and support to clients identified as being at increased risk for type 2 diabetes. Economic evidence indicates that these programs are cost-effective.

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* For a list of Community Preventive Services Task Force members, see the **Appendix** (available at www.annals.org).

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The Community Preventive Services Task Force (Task Force) makes recommendations about community- and system-based interventions, determined by the Task Force to be of public health importance in preventing illness, injury, or premature death. The Task Force bases its recommendations on a systematic review of the evidence on effectiveness and also considers additional benefits, potential harms, and applicability to settings and populations other than those studied. For interventions with evidence of effectiveness, the Task Force also conducts a systematic review of the evidence on economic efficiency, including assessments on program costs, cost-effectiveness, and cost–benefit ratios.

The Task Force recognizes that a decision to implement an evidence-based intervention involves more consideration than evidence alone. Potential implementers should understand the evidence but customize decision making to the specific populations and settings in which the intervention will be implemented, and take into account relevant constraints (for example, resources).

Summary of Recommendations and Evidence

The Task Force recommends combined diet and physical activity promotion programs for persons at increased risk for type 2 diabetes on the basis of strong evidence of effectiveness in reducing new-onset diabetes. Combined diet and physical activity promotion programs also increase the likelihood of reversion to normoglycemia and improve diabetes and cardiovascular disease risk factors (weight, blood glucose levels, blood pressure, and lipid levels). These programs are effective across a range of counseling intensities, settings, and implementers. Programs commonly include a weight-loss goal, individual or group sessions (or both) about diet and exercise, meetings with a trained diet or exercise counselor (or both), and individually tailored diet or exercise plans (or both). Higher-intensity programs lead to greater weight loss and reduction in new-onset diabetes.

Economic evidence indicates that such programs aimed at preventing type 2 diabetes among persons at increased risk are cost-effective. A summary of the Task Force findings and rationale can be found at www.thecommunityguide.org/diabetes/combineddietandpa.html.

Intervention Definition

Combined diet and physical activity promotion programs actively encourage persons who are at increased risk for diabetes to improve their diet and increase their physical activity. Critical components include the following:

- Trained providers in clinical or community settings who work directly with program participants for at least 3 months
- Some combination of counseling, coaching, and extended support
- Multiple sessions related to diet and physical activity, delivered in person or by other methods

Programs may also use 1 or more of the following:

- Diet counselors in different specialties (for example, nutritionists, dietitians, or diabetes educators), ex-

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ercise counselors in different specialties (for example, physical educators, physiotherapists, or trainers), physicians, nurses, and trained laypersons

- A range of intensity of counseling, with many or few sessions, longer- or shorter-duration sessions, and individual or group sessions
- Individually tailored or generic diet or physical activity programs
- Specific weight-loss or exercise goals
- A period of maintenance sessions after the primary core period of the program

TARGET POPULATION

Program participants may be considered at increased risk for type 2 diabetes if they have blood glucose levels that are abnormally elevated but not high enough to be classified as type 2 diabetes (1). Persons at increased risk have hemoglobin A_{1c} levels between 5.7% and 6.4%, fasting plasma glucose levels between 100 and 125 mg/dL, or plasma glucose levels between 140 and 199 mg/dL after a 75-g oral glucose tolerance test. In some programs, validated predictive tools, such as the Finnish Diabetes Risk Score, may be used to identify persons at increased risk (2, 3).

RATIONALE

Basis of Findings

The Task Force recommendation is based on evidence from a systematic review of 53 studies that described 66 programs (search period, January 1991 to February 2015) (4). Findings demonstrated the effectiveness of combined diet and physical activity promotion programs in reducing the risk for type 2 diabetes, increasing the likelihood of reversion to normoglycemia, and reducing weight among persons at increased risk for type 2 diabetes. Combined programs also were effective at reducing participants' blood glucose levels and blood pressure and improving their lipid levels. The effectiveness of these programs in reducing cardiovascular disease, diabetes-related complications, and death was unclear because few studies reported these outcomes or had results from long-term follow-up.

The beneficial effects of combined programs were seen across a wide range of intensity levels. The 53 included studies evaluated 66 programs that ran from 3 months to 6 years. Five programs (in 4 studies) ran for less than 6 months; the remainder ran for 6 months or longer, and the overall median program length was 12 months (interquartile interval [IQI], 10 to 27 months). Evaluated programs provided between 0 (virtual sessions only) and 72 sessions, with a median of 15 sessions (IQI, 6 to 24 sessions).

Except for 7 programs that were delivered entirely over the Internet, by video, or by e-mail, programs used a combination of in-person individual and group sessions. Programs offered individual sessions on diet (40 programs) or exercise (41 programs), group sessions on diet (41 programs) or exercise (39 programs), or both individual and group sessions on diet (24 programs) or exercise (24 programs). Sessions were led by different combinations of trained diet counselors, including dietitians or nutritionists (among others) (37 programs); trained exercise counselors, including physical trainers (among others) (26 programs); nurses (15 programs); physicians or psychologists (8 programs); or trained laypersons (13 programs). Many studies included specific weight-loss goals (42 programs), diet goals (19 programs), and physical activity goals (32 programs). Some studies included individually tailored plans for diet (16 programs) and physical activity (23 programs). Regardless of program features, almost all programs led to weight loss, reduced risk for diabetes, or both.

Although the evaluated programs differed from each other too much to draw firm conclusions about the unique contributions of specific components, results from 12 studies that directly compared programs showed that persons who received more intensive programs (based on such features as number of sessions, individual sessions, and additional personnel) lost more weight and were less likely to develop diabetes.

Economic Evidence

An economic review of 28 studies (search period, January 1985 to April 2015) showed that combined diet and physical activity promotion programs for persons at increased risk for type 2 diabetes are cost-effective (5). Twelve studies provided information on program costs, including the cost of identifying persons at increased risk for type 2 diabetes (reported in only 4 studies) and the cost of implementing the program. The median cost per participant was $653 (IQI, $383 to $1160). The wide range in costs was partially explained by variation across programs in the number of sessions, delivery method of the core sessions (individual vs. group), setting (clinical trial vs. community or primary care), and type of personnel used (health professionals vs. trained laypersons).

Twenty-one studies assessed the cost-effectiveness of programs by estimating incremental cost-effectiveness ratios (ICERs) from a health system perspective. The median ICER was $13 761 (IQI, $3067 to $21 899 [16 studies]) per quality-adjusted life-year. The wide range in ICERs was partially explained by variation in the cost and effectiveness of the programs, program delivery methods, patient follow-up times, and delivery settings. Subgroup analysis of 5 studies that reported ICERs for both individual and group-based programs indicated that the latter were more cost-effective.

APPLICABILITY

The Task Force findings are considered applicable to a range of settings within or outside the United States; in health care or community-based settings; and in urban, suburban, or rural communities. Based on evidence from 2 of the larger studies (the U.S. DPP [Diabetes Prevention Program] study [6] and the Finnish DPS [Diabetes Prevention Study] [7]), findings are con-

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sidered applicable to populations that vary in race and ethnicity, socioeconomic status, risk factor status, and other demographic features. Both the DPP study and the DPS found larger beneficial effects in older participants but no effect differences on sex, race, ethnicity, income, or educational attainment.

Other Benefits and Harms

In 17 studies that reported blood pressure outcomes and 14 that reported lipid outcomes, programs reduced systolic and diastolic blood pressures and improved lipid levels, including total, low-density lipoprotein, and high-density lipoprotein cholesterol levels and triglyceride levels. None of the studies included in this review reported any long-term harms directly related to program participation.

Considerations for Implementation

In 2010, the U.S. Congress authorized the Centers for Disease Control and Prevention to establish the National Diabetes Prevention Program. The goal of the program, an alliance of public and private organizations (including insurers), is to achieve wide-scale implementation and coordination of lifestyle change programs to prevent or delay type 2 diabetes (8). Several national and state organizations, most of which are part of the National Diabetes Prevention Program, have successfully implemented combined diet and physical activity promotion programs. In 2008, Montana implemented a group session–based adaptation of the program used in the DPP study. The Montana program has had success in line with the DPP study, and more than 4500 adults at high risk for type 2 diabetes have been referred by physicians, recruited, and enrolled into the program since 2008. Of those enrolled, 81% have completed the program and 45% have achieved the program's weight-loss goal of 7% (9). In 2004, the YMCA began offering an adaptation of the DPP study program that provided participants with low-cost group sessions for 1 year and included 16 weekly core sessions followed by 8 monthly maintenance sessions (10). In 2010, the YMCA began partnering with health plans to scale up the program, and by 2012 they had reached 46 communities in 23 states and trained 500 lifestyle coaches at a cost of about $400 per program participant (11). Since 2010, about 16 000 program participants have been enrolled in almost 750 community locations in 39 states. Another example of a successful program working in concert with the principles of the National Diabetes Prevention Program is the Diabetes Prevention demonstration project of the Special Diabetes Program for Indians, which has been implemented in 36 health care programs and serves 80 American Indian and Alaska Native tribes (12).

Health care providers are usually the primary resource for persons newly diagnosed as being at increased risk for type 2 diabetes. Providers need to be aware of the benefits of combined diet and physical activity promotion programs and of pertinent local programs offered by community centers or run by insurers or nonprofit or other private contractors.

The ability to pay for program services can be a barrier for some people. However, many employers provide programs as a covered health benefit, and an increasing number of private insurance companies reimburse for program delivery. Program uptake can increase greatly when health insurers (private or public) cover participation costs. For example, in Montana, the state collaborated with the state Medicaid program to reimburse program sites for services delivered to program participants enrolled in Medicaid. In addition, several organizations provide free online materials for use by programs and participants, including some designed for specific groups (for example, African American faith-based programs). Training materials from successful programs, including the DPP study, are also available online.

Evidence Gaps

Several areas would benefit from additional research, including the relative effectiveness of specific programs in different populations; the effectiveness of programs delivered via the Internet, e-mail, apps, or social networking; and the relative effectiveness of individual- and group-based programs. More evidence based on actual data is needed on the costs and benefits of programs implemented in community or primary care settings, including findings on cost-effectiveness, cost–utility ratios, and cost–benefit ratios. More information about group-based programs delivered by trained laypersons in community settings would be especially useful. Studies should also evaluate costs associated with recruiting eligible persons to participate, which may be high in both clinical and community settings.

From the Community Preventive Services Task Force, Atlanta, Georgia.

Disclaimer: Recommendations made by the Task Force are independent of the U.S. government and should not be construed as an official position of the Centers for Disease Control and Prevention or the U.S. Department of Health and Human Services.

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Requests for Single Reprints: Reprints are available from the Community Guide Web site (www.thecommunityguide.org/diabetes/index.html).

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Appendix: Community Preventive Services Task Force

Members of the Community Preventive Services Task Force at the time this recommendation was finalized† are Jonathan E. Fielding, MD, MPH, MBA, *Chair* (University of California, Los Angeles, Schools of Public Health and Medicine, Los Angeles, California); Barbara K. Rimer, DrPH, MPH, *Co-Vice Chair* (University of North Carolina Gillings School of Global Public Health, Chapel Hill, North Carolina); Robert L. Johnson, MD, *Co-Vice Chair* (New Jersey Medical School, Rutgers, the State University of New Jersey, New Brunswick, New Jersey); Ned Calonge, MD, MPH (The Colorado Trust and University of Colorado, Denver, Schools of Medicine and Public Health, Denver, Colorado); Marshall H. Chin, MD, MPH (University of Chicago Department of Medicine and Chicago Center for Diabetes Translation Research, Chicago, Illinois); John M. Clymer (National Forum for Heart Disease & Stroke Prevention, Washington, DC, and Loma Linda University School of Public Health, Loma Linda, California); Karen Glanz, PhD, MPH (University of Pennsylvania, Schools of Medicine and Nursing, Philadelphia, Pennsylvania); Ron Z. Goetzel, PhD, MA (Institute for Health and Productivity Studies, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, and Truven Health Analytics, Bethesda, Maryland); Lawrence W. Green, DrPH (University of California, San Francisco, San Francisco, California); David C. Grossman, MD, MPH (Population and Purchaser Strategy, Group Health Cooperative and Group Health Research Institute, Seattle, Washington); Shiriki Kumanyika, PhD, MPH (University of Pennsylvania, Philadelphia, Pennsylvania); Gilbert S. Omenn, MD, PhD (Center for Computational Medicine and Bioinformatics, University of Michigan, Ann Arbor, Michigan); C. Tracy Orleans, PhD (Robert Wood Johnson Foundation, Princeton, New Jersey); Nicolaas P. Pronk, MA, PhD (HealthPartners Research Foundation, Minneapolis, Minnesota, and Harvard School of Public Health, Cambridge, Massachusetts); and Patrick L. Remington, MD, MPH (University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin).

† For a list of current Task Force members, go to www.thecommunityguide.org/about/task-force-members.html.