



Diabetes and Physical Activity

Practice Synopsis

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Introduction

Physical activity is a cornerstone of type 2 diabetes prevention and treatment. Comorbid conditions such as hypertension, depression and heart disease can also be treated with a regular exercise program. It received renewed attention when the American College of Sports Medicine and the American Diabetes Association released a joint position statement in 2010 recommending regular exercise for persons with diabetes.¹ Recent statistics suggest that less than 50% of all Americans meet the Physical Activity Guidelines of 30 minutes of moderate-to-vigorous intensity aerobic exercise at least 5 days a week or a total of 150 minutes per week; and less than 21% meet the physical activity guidelines for both aerobic and muscle-strengthening.² Beyond general guidelines and support, the diabetes educator addresses diabetes-specific safety considerations at all times. Diabetes educators play a unique and influential role in promotion of regular physical activity as a tool to support optimal diabetes management and overall health.

Background

In the United States, diabetes imposes direct and indirect costs of \$245 billion³ The burden of diabetes in the U.S. has risen exponentially as the prevalence of the disease has reached epidemic proportions. Physical activity is defined as bodily movement produced by the skeletal muscle that requires energy expenditure.⁴ Planned, structured, and repetitive physical activity (exercise) can offer general as well as diabetes-specific health benefits. Habitual participation in physical activity can reduce the risk of cardiovascular disease, body weight and percentage of body fat⁵ along with positively affecting lipids, blood pressure, cardiovascular events, mortality, and quality of life.^{1,6} This is an important consideration given a two- to four-fold increased risk of mortality resulting from cardiovascular complications associated with diabetes.⁷

In addition, the World Health Organization has identified physical inactivity as the fourth leading risk factor for global mortality.⁴ Exercise recommendations have shifted away from a rather narrow focus on structured aerobic exercise toward recommendations that incorporate a broader construct emphasizing the benefits of moderate, unstructured lifestyle physical activity. This broad approach offers options for physical activity that are feasible for everyone, including the deconditioned and sedentary. Evidence supports that all individuals, including those with diabetes, should reduce sedentary time by breaking up periods of sitting to no more than 90 minutes.⁸ The amount of sedentary time has also been linked to time in hyperglycemia, restating the importance of individualized interventions to decrease the amount of time spent in sedentary activity.⁹

Individuals with prediabetes, defined by the presence of either impaired glucose tolerance or impaired fasting glucose, have an increased risk for development of type 2 diabetes and are at high risk for cardiovascular events as well. Lifestyle interventions which include physical activity and weight loss have been shown to delay or prevent the onset of type 2 diabetes and reduce cardiovascular risk factors.^{1,10}

Regular physical activity affects overall glycemic control through improved insulin sensitivity, lowered insulin requirements, and improved glucose tolerance.¹¹ Collectively, these health benefits may contribute to a reduction in the risk for long-term diabetes complications, slow the progression of existing complications and enhance quality of life.

Improvements in overall blood glucose control in association with physical activity have been well documented in type 2 diabetes. Studies demonstrating improvement in blood glucose levels associated with physical activity and exercise in individuals with type 1 diabetes have been less consistent. Exercise can lead to significant blood glucose variability and management challenges for those individuals requiring insulin treatment.¹² This is due to the change in insulin sensitivity as well as non-insulin mediated glucose transport into the skeletal muscle during activity. However, there is recent data to suggest aerobic fitness may be inversely associated with glycemic variability.^{13,14} The overall benefits in regard to reduction in risk of heart disease and early death with regular physical activity in the individual with type 1 diabetes has been established and is strongly encouraged.

Although physical activity offers numerous health benefits, it also can carry potential risks for individuals with diabetes. Acute complications, hyperglycemia and hypoglycemia, can be exacerbated by physical activity. Individuals wanting to increase physical activity intensity should be referred to a healthcare provider (HCP) for clinical judgment and potential exercise evaluation. Further recommendations by an exercise physiologist or other clinical exercise specialist are suggested. Exercise testing prior to initiating a walking program is generally unnecessary.¹

Being active is an essential component of the AADE7 Self-Care Behaviors™. The important role that both lifestyle physical activity and structured exercise play in the management of type 1, type 2 diabetes, prediabetes, and potential co-morbid conditions is well established and should be strongly encouraged.

A safe and effective exercise prescription for the individual with diabetes depends on the careful weighing of multiple factors and sound clinical judgment. This should not preclude the recommendations for physical activity, however, an assessment of the individual's medical history and physical examination will help determine the degree of risk and identify the most appropriate physical activity.

Areas of physiological concern include the following:

- When BG values are above 300 mg/dl during physical activity, hydration is important. If BG results are consistently elevated, patients should consult with their HCP and/or diabetes specialist prior to continuing their regular exercise program.¹⁵
- Persons with type 1 diabetes should check for ketones if BG is greater than 300 mg/dl. If present, activity should be delayed, individual should hydrate and follow plan of care for

elevated ketones. However, it is not necessary to postpone physical activity based simply on hyperglycemia, provided the patient feels well and urine and/or blood ketones are trace or absent.⁸

- Peripheral neuropathy is a concern in regards to foot injury. Individuals without acute ulceration can participate in moderate weight bearing exercise. Careful attention to appropriate foot wear and any signs of foot damage should be emphasized.¹¹Balance may also be compromised and should be evaluated due to increased risk of falls.¹⁶Consider consultation with a podiatrist to determine patient's risk.
- Autonomic neuropathy increases the risk of silent heart attack and hypotension. If there are unexplained symptoms and feelings of extreme fatigue which last for more than a few minutes, physical activity should be stopped and the individual should be coached to report it immediately to their HCP. The individual may also have more difficulty adjusting to temperature extremes and should consider this when choosing a physical activity for that day.^{1,11} Evaluation by their HCP is appropriate and the individual may be referred to a cardiac rehabilitation program for monitoring during exercise.
- Those with a history of uncontrolled proliferative retinopathy should avoid activities that increase the risk of intraocular pressure such as the Valsalva maneuver that include lifting heavy weights or jarring the head, that may occur in contact sports. In the absence of hemorrhaging, individuals can participate in moderate activity.¹

Identification of barriers that might prevent success with physical activity participation should also be evaluated.¹⁷ Individuals may state they:

- Do not have enough time for physical activity
- Find physical activity inconvenient
- Are fatigued
- Are in pain
- Lack self-motivation
- Do not find physical activity enjoyable
- Find physical activity boring
- Lack confidence in their ability to be physically active (low self-efficacy)
- Fear being injured or have been injured recently
- Lack self-management skills, such as the ability to set personal goals, monitor progress, or reward progress toward such goals
- Lack encouragement, support, or companionship from family and friends
- Do not have parks, sidewalks, bicycle trails, or safe and pleasant walking paths convenient to their homes or offices

Despite its many benefits, physical activity remains an underutilized therapeutic modality in diabetes self-management. Referral for diabetes self-management education and support and the use of physical activity prescriptions are essential. The "exercise" prescription should indicate the specific reasons physical activity is being prescribed.

Role of the Diabetes Educator

Diabetes educators play a vital role in promotion and encouragement of interventions that support the integral function that being active holds in diabetes self-management. This includes working with patients to identify the best program for each person, based on individual needs

and preferences as well as support to overcome barriers. Diabetes educators use established, sound exercise guidelines and resources to develop physical activity programs using pre-exercise assessment to provide realistic options for patient selected physical activity choices.

Diabetes Educators:

- Recommend safe and effective physical activity options/interventions.
- Evaluate physical, cognitive, and emotional barriers to a regular physical activity program.
- Apply counseling strategies that enhance adoption and long-term maintenance of a physical activity habit. These include assisting in a plan to introduce exercise in a safe and progressive manner, emphasizing proper selection and progression toward attainment of these goals.
- Work with the individual to develop an appropriate activity plan that balances food and medication with the activities.
- Support the individual to set SMART goals (Specific, Measureable, Attainable, Realistic, and Timely) for their physical activity.
- Ensure ongoing support through collaboration with exercise professionals and facilities such as community center, senior center, YMCA, private health clubs.
- If unfamiliar with blood glucose management with exercise and type 1 diabetes, refer to colleagues who specialize in diabetes and sports.
- Collect and analyze outcomes data relating to physical activity. The measurement of outcomes associated with being active is vitally important to the long-term success and availability of physical activity programs. For example, a simple test that can be performed before and after intervention such as the 6 minute walk test, 2 minute step test or 30 second chair stand.
- Encourage the creation of safe places to be physically active within the community and enhance efforts to mitigate barriers to physical activity

Recommendations and Guidelines for Being Active:

- Regular activity is important for the metabolic health of all people.
- Individuals with or at risk for diabetes should engage in appropriate levels of daily physical activity based on personal preference and physical limitations.
- For those individuals taking insulin, learning to adjust food and insulin dosing around exercise and monitoring blood glucose frequently is highly recommended for success
- People with diabetes should perform aerobic exercise at moderate intensity 3 or more days per week for a total of 150 minutes minimum per week. For those who have been sedentary, these individuals should request clearance from their health care provider prior to beginning an exercise program.
- Muscle strengthening training which includes weight machines, free weights, resistance bands etc. should be performed 2 or more days per week.
- Reduce sedentary time by incorporating movement all day, for example: use the stairs, park farther away from doors, walk on breaks, walk to deliver messages rather than using the computer or phone, use a restroom or water fountain that is further away than usual. The goal is to get up and moving at least every 90 minutes.

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