

In Brief

Physical activity and the exercise prescription is an integral component of the diabetes self-management training (DSMT) plan for any patient with diabetes or anyone at risk for developing type 2 diabetes. Diabetes educators from a variety of health care professions are responsible for the successful inclusion of this component into lifestyle behaviors. Current recommendations describe the multidisciplinary team approach as the preferred delivery system for DSMT.

Diabetes Educators and the Exercise Prescription

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The treatment and care of diabetes is based on teaching the skills and information needed to best manage the disease on a day-to-day basis. In this modern era of medicine, the body of knowledge surrounding the care and prevention of diabetes expands almost hourly. This rapid and expanded understanding has made it necessary for many different health care disciplines to become involved in the diabetes self-management training (DSMT) process. As a result, the field of diabetes education has become a subspecialty of many health care professionals.

Over the past few decades, this subspecialty has gained momentum as more and more health care professionals have been drawn to the field. And along the way, these multidisciplinary professionals have worked together on task forces, committees, and boards to improve the delivery of diabetes education. Progress has required tireless effort and a unified vision. Following is a list highlighting just a few of the defining moments that have resulted from these collaborative efforts:

- The American Association of Diabetes Educators (AADE) was established in 1974.
- The American Diabetes Association (ADA) presented its first “Outstanding Educator in Diabetes” Award in 1977.
- The National Standards for Diabetes

Patient Education Programs were first developed by the National Diabetes Advisory Board and published in *Diabetes Care* in 1984.

- The National Certification Board of Diabetes Educators (NCBDE) offered the first Certified Diabetes Educator (CDE) exam in 1986.
- The ADA recognized the first programs to meet the National Standards for Excellence in diabetes education in 1987.
- Congress passed Medicare benefits for DSMT in 1997.

Although progress has been made in many areas of diabetes education, the training, tools, and financial resources to implement and maintain physical activity for DSMT and diabetes prevention has not kept pace. This is in contrast to the medical evidence supporting the inclusion of exercise as part of diabetes management in early Roman and Greek times¹ and again with the discovery of insulin.² While modern medicine does recognize the role exercise has in diabetes care, it is rare to find a successful and effective practitioner. In his writings, Elliott P. Joslin, MD, often highlighted the importance of exercise as part of the diabetes management plan. “To many persons exercise seems a luxury, but a diabetic is fortunate in that he must always consider exercise a necessity.”³ Joslin would frequently visit the local

dog shelter in order to “gift” his more sedentary patients with a reason to walk twice a day.

So, although the importance of physical activity in the prevention and treatment of diabetes is well known among today’s clinicians,⁴ the skills, experience, and knowledge required for the implementation of the exercise prescription are often lacking. As already stated, diabetes educators come from a variety of health care backgrounds. Among the health care professionals currently eligible by NCBDE criteria to pursue the certified diabetes educator certification are registered nurses, dietitians, occupational therapists, optometrists, pharmacists, physical therapists, physicians, physician’s assistants, podiatrists, social workers, clinical psychologists, exercise physiologists, and health educators.⁵ Regardless of academic preparation or professional training, any of these professionals can be responsible for developing and implementing the exercise prescription as part of the DSMT plan. It is important to note that only physical therapists and exercise physiologists have studied academic curriculums and performed clinical internships developed specifically to meet the health challenges and fitness needs of patients encountered in a medical setting.

This article will provide guidance for diabetes educators regardless of health care background by defining the assessment process and the information required to develop the exercise prescription. It will also examine the contributions of clinical exercise professionals to the diabetes team, specifically within the scope of practice for reimbursement potential. And finally, professional resources will be highlighted and recommended for all diabetes educators to investigate.

Assessment for an Exercise Prescription

Before initiation of an exercise program, people with diabetes should undergo a medical assessment. The ADA recommends a medical evaluation to screen for the presence of micro- and macrovascular complications that could be worsened by physical activity. Glycemic control should be evaluated as well.⁶ Once this evaluation has been done, an exercise assessment should be carried out to allow prescription of an appropriate exercise program for the individual. This will be based on the person’s

goals, exercise/physical activity history, diabetes history including control and complications, medical history, orthopedic problems, cardiovascular status, and motivation/psychosocial issues. Physical activity such as household chores, yard work, recreational interests, and activity at work should be included in the assessment and activity prescription. The assessment is generally carried out individually with a diabetes educator but may be done in a group format before DSMT.

The exercise prescription should be based on the patient’s personal goals. Likely goals include improved glycemic control, reduced cardiovascular risk, weight loss, and increased strength or endurance. Some may want to exercise for general fitness, whereas others have competitive athletic goals. Diabetes history should include type of diabetes, duration of diabetes, presence of complications of diabetes, treatment for glucose control, frequency of self-monitoring of blood glucose, frequency of hypoglycemia, including severity and relationship to activity, and current diabetes control (hemoglobin A_{1c}). The presence of neuropathy, foot deformities, current or past open wounds, retinopathy, macular edema, glaucoma, nephropathy, and cardiovascular disease (CVD; coronary artery disease, congestive heart failure, peripheral vascular disease, or cerebrovascular accident) should be addressed.

People with type 2 diabetes may have had elevated blood glucose levels for some time before the diagnosis of diabetes. Complications of diabetes may be present at the time of diagnosis. People with type 2 diabetes may need a more extensive pre-exercise evaluation from the time of diagnosis compared to those newly diagnosed with type 1 diabetes. Examples include more extensive cardiac and ophthalmological examinations, which will be described later. Information about the duration of diabetes guides the pre-exercise evaluation for this same reason. A person with type 1 diabetes of short duration may not need extensive testing regarding complications, which may be recommended for those with type 1 diabetes of longer duration.

Treatment for glycemic control may range from meal planning and exercise to oral agents to insulin or some combination of these. This is important information with regard to exercise when considering the likelihood of

hypoglycemia. The history of activity-related hypoglycemia should be investigated to allow recommendations for prevention and treatment with exercise. Hypoglycemia is a common acute complication from physical activity in those with diabetes, initially described by Lawrence in 1926.² All people treated with insulin and those on oral medications that increase insulin production are at risk for hypoglycemia. Research has shown that intensive control of blood glucose increases the risk of hypoglycemia with exercise.⁷

The patient should be asked about frequency of hypoglycemia, its relationship to exercise/physical activity, past adjustments to limit hypoglycemia, and results of these adjustments. The person’s goals should be assessed to determine adjustments. If weight control or weight loss is a goal, attempts should be made to plan for exercise and to decrease the rapid- or fast-acting insulin that is working at the time of exercise. If the person is not concerned about the consumption of extra calories to allow for exercise (growing children and adolescents or slender adults) or if the activity is not planned, additional carbohydrate can be consumed.

Blood glucose monitoring may need to be increased before, during, and after activity to determine the need for insulin adjustments or snacking. People with diabetes should be questioned about the availability of fast-acting glucose during and after exercise. Commonly used treatments include glucose tablets, glucose gel, juice, sports drinks, and sugar. A review of hypoglycemia treatment should be performed frequently but specifically when activity level will be changing, after a hypoglycemic episode, and with changes in the medication regimen. Patients should be encouraged to contact the diabetes educator and/or physician if severe or frequent hypoglycemia occurs, to allow for medication adjustments. People who increase their activity and experience hypoglycemia may report increased weight in spite of increased activity.⁷ It is important to ask patients directly about hypoglycemia because they may forget to report episodes, self-treat repeatedly, and subsequently experience weight gain. Because many people exercise at least in part to lose or control weight, hypoglycemia is a troublesome and potentially dangerous result that can be minimized with education.

The ADA recommends guidelines to avoid exercise-induced hypoglycemia in insulin-treated patients. Blood glucose testing may be necessary before, during, and after exercise. Extra carbohydrate may need to be consumed before unplanned exercise, and insulin may need to be decreased after the activity. Insulin doses may be decreased before and after exercise. The amount will depend on the intensity of exercise, duration of exercise, and past experience of the patient. Easily absorbable carbohydrate may need to be consumed during exercise, and additional carbohydrate may be necessary after activity.⁸

Presence of complications will dictate the exercise assessment and prescription. Foot conditions that limit weight-bearing exercise include an insensate foot, foot deformities (cocked-up toes and Charcot foot), foot ulcer, and previous foot ulcer.⁸ The exercise assessment and prescription offer an opportunity for the educator to review foot care guidelines, including visual inspection and proper footwear.

The presence of retinopathy should be evaluated to allow safe activity guidelines based on level of retinopathy. All patients with type 2 diabetes and those with type 1 diabetes who are over the age of 10 years and have had diabetes of > 3–5 years' duration should have a dilated eye exam before starting an exercise program.⁸ People without diabetic retinopathy or who only have mild nonproliferative diabetic retinopathy (NPDR) do not have activity limitations. Those with moderate, severe, and very severe NPDR and those with proliferative diabetic retinopathy should be educated on the limitations for activity, including exercise and routine activities.⁸ Macular edema and glaucoma should be evaluated by an ophthalmologist or optometrist with activity guidelines determined by the results of the examination.

Nephropathy should be taken into account when prescribing intensity of exercise. Light to moderate exercise is generally considered safe and beneficial for those with incipient nephropathy or microalbuminuria (30–299 mg/day). For those with overt nephropathy or clinical albuminuria (> 300 mg/day), strenuous exercise (> 70% maximum heart rate or > 60% of the maximal volume of oxygen that can be consumed [$\dot{V}O_{2max}$]) should be avoided. People

with overt nephropathy will often have diminished capacity for activity, causing a self-limitation on strenuous exercise.⁸

Medical and orthopedic history will be valuable when creating a safe exercise prescription. Common medical problems that would be important include hypertension, orthostatic hypotension, syncope, history of falls, dyspnea on exertion, dyslipidemia, and current medications and their side effects. People with an increased risk of falls should be guided to activities that minimize this risk. Sitting activities are encouraged (stationary bike), whereas those with quick changes from sitting to standing and those likely to increase the risk of falls should be discouraged. Dyspnea on exertion and dyslipidemia are often related to increased risk of cardiovascular problems, which will be discussed later.

Orthopedic problems commonly interfere with physical activity. An evaluation should include current and past painful conditions. Types of activities that tend to increase and decrease pain should be reviewed with each patient. For example, some people with low back pain may report an increase in pain with walking and a decrease in pain with sitting, making recumbent activities, such as riding a stationary bike, an exercise option. Others with back pain get relief with walking, allowing this as a possible exercise.

Some people may need an intervention before starting an exercise program, such as an orthopedic evaluation or physical therapy to decrease pain and allow for a subsequent increase in exercise. Common orthopedic problems that limit exercise and activity include neck and low back pain, degenerative joint disease in the hip, plantar fasciitis, shoulder pain, and a variety of conditions that cause knee pain.

Because CVD is the major cause of mortality for people with diabetes, a careful evaluation should be performed before initiating an exercise program. First, the existence of any cardiac risk factors should be determined and emphasis should be placed on their treatment in the attempt to prevent or slow CVD. These risk factors include dyslipidemia, hypertension, smoking, a positive family history of premature coronary disease, and the presence of micro- or macroalbuminuria.⁶

When a patient with diabetes is being counseled to begin a fitness program that exceeds the demands of everyday living (more intense than brisk walking), a graded exercise test should be seriously considered in previously sedentary individuals. This would correlate to meeting any of the following criteria:

- Age > 40 years with or without CVD risk factors other than diabetes
- Age > 30 years and
 - Type 1 or type 2 diabetes of > 10 years' duration
 - Hypertension
 - Cigarette smoking
 - Dyslipidemia
 - Proliferative or preproliferative retinopathy
 - Nephropathy, including microalbuminuria
- Any of the following, regardless of age
 - Known or suspected coronary artery disease, cerebrovascular disease, and/or peripheral vascular disease
 - Autonomic neuropathy
 - Advanced nephropathy with renal failure

Problems with motivation and psychosocial issues often interfere with adherence to an exercise regimen and the level of physical activity. The assessment can address these issues by considering social support (emotional support as well as exercise partners), interests, past successes and challenges with exercise, and time of day most likely to allow consistency of exercise. Interest and convenience of exercise options should be addressed. People with diabetes should provide exercise preferences, though educators may need to offer options that may not be evident to patients. There may be psychosocial benefits from exercise. However, depression, stress, and anxiety may need to be controlled to allow the initiation of an exercise routine.

The exercise prescription should be realistic to allow early successes. This includes choosing an appropriate mode, duration, frequency, and intensity of exercise. Once the routine is established, increases can be made to reach long-term exercise goals.

Exercise Prescription Within the Diabetes Team

Physicians are only able to provide sporadic exercise counseling during clinic visits.⁹ One study concluded

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that “although adults with [diabetes] have a high prevalence of modifiable CVD risk factors, counseling by physicians about lifestyle modification is less than optimal. There is a need to improve patient counseling for lifestyle modification by primary care physicians.”¹⁰ While still controversial, there is some indication in the literature that diabetes “sub-specialist care clearly improves long-term, clinically important outcomes in patients with diabetes. Our challenge as a society is to provide more endocrinologists and other members of the diabetes team who are intensively educated specialists devoted to the care of patients with diabetes.”¹¹

The AADE has identified primary areas of responsibility for diabetes educators. The Scope of Practice charges diabetes educators with incorporating physical activity into the lifestyle of people with diabetes.¹² In 2003, the AADE published data that identified seven behaviors common among patients who are able to achieve better health outcomes with diabetes. “Being active” is listed as one of the AADE’s seven self-care behaviors, emphasizing that even small changes in the physical activity levels are considered beneficial.¹³ The remaining behaviors are eating healthy, monitoring, taking medications, problem solving, using coping skills, and reducing risk.

In all ADA-recognized diabetes education programs, exercise is a formal part of the curriculum.¹⁴ It is also required that education teams consist of a minimum of a nurse educator and a dietitian. Other potential members of the team include an exercise specialist, a pharmacist, a podiatrist, a psychologist/social worker, and a physician. Regardless of who makes up the education team, it is the responsibility of team members to assess the exercise needs of patients, to teach the appropriate educational content, and to oversee behavior change as it progresses. Most of the time, the performance of the exercise prescription is left to the patients to try on their own. While diabetes educators would never let patients leave their office without being able to demonstrate that they can use a blood glucose meter or safely inject insulin, patients rarely have the opportunity to be supervised when learning how to perform the exercise prescription.

There are many reasons why this occurs; most are because of a lack of

financial resources to support exercise facilities or to hire clinical exercise professionals. However, in contrast to clinical staffs, the research literature frequently reveals the inclusion of clinical exercise professionals as part of the team performing diabetes education investigations,^{15,16} lifestyle modification studies,^{17,18} and diabetes prevention efforts.^{19,20} The next sections will review the scope of practice and the reimbursement potential of two types of clinical exercise professional: physical therapists and clinical exercise physiologists.

Physical Therapists

Physical therapists have the knowledge and training to develop safe exercise programs for people with diabetes.²¹ Physical therapy is defined as “the evaluation, treatment, or prevention of disability, injury, disease, or other condition of health using physical, chemical, and mechanical means including . . . therapeutic exercise with or without assistive devices, and the performance and interpretation of tests and measurements to assess pathophysiological, pathomechanical, and developmental deficits of human systems to determine treatment, and assist in diagnosis and prognosis.”²²

The practice of physical therapy varies from state to state; however, the key points of this definition are fairly consistent. Given this, physical therapists are an excellent source for those with diabetes for evaluation and prescription of exercise. People with cardiovascular and/or musculoskeletal problems would especially benefit from consultation from a physical therapist. Some states allow patients to access the services of a physical therapist without a referral, whereas others require a referral from a physician or other health professional. Physical therapists should consult the practice act in their state for details regarding referral and practice guidelines. Insurance reimbursement is generally available for interventions related to the management of diabetes. However, exercise programs prescribed and monitored for the prevention of diabetes may not be covered.²³

Clinical Exercise Physiologists

Exercise physiologists can be found working in many different settings. The main areas have been academic, fitness, research, and clinical. The role of clinical exercise physiologists is defined by the American College of

Sports Medicine (ACSM) as someone who “works in the application of exercise and physical activity for those clinical and pathological situations where it has been shown to provide therapeutic or functional benefit. Patients for whom services are appropriate may include, but not be limited to, those with cardiovascular, pulmonary, metabolic, immunological, inflammatory, orthopedic, and neuromuscular diseases and conditions. This list will be modified as indications and procedures of application are further developed and matured. Furthermore, the clinical exercise physiologist applies exercise principles to groups such as geriatric, pediatric, or obstetric populations, and to society as a whole in preventive activities. The clinical exercise physiologist performs exercise evaluation, exercise prescription, exercise supervision, exercise education, and exercise outcome evaluation. The practice of the clinical exercise physiologist should be restricted to clients who are referred by and are under the continued care of a licensed physician.”²⁴

The written exam to become a registered clinical exercise physiologist is one of the clinical track certifications offered by the ACSM. This exam is restricted to candidates who complete a graduate degree in exercise science, exercise physiology, or physiology from a regionally accredited college or university and who accumulate the required number of relevant experience hours.²⁴

At this time, clinical exercise physiologists cannot bill directly for their time spent supervising exercise services and sessions. This will most likely be reexamined as changes occur within the profession that lead to licensing. Until then, these exercise professionals provide patient care collaboratively with other health professionals who are able to process the insurance information within wellness, cardiopulmonary rehabilitation, and physical therapy programs. In regard to diabetes, there is no accepted coding that can be reimbursed for exercise sessions. However, while exercise sessions cannot be billed for a diabetes population, there is reimbursement for DSMT delivered by diabetes educators.

Diabetes Educators

AADE defines diabetes educator as a “healthcare professional who has mastered the core of knowledge and

skills in the biological and social sciences, communication, counseling, and education, and who has experience in the care of people with diabetes. The role of the diabetes educator can be assumed by various health-care professionals, including, but not limited to, registered nurses, registered dietitians, pharmacists, physicians, mental health professionals, podiatrists, and exercise physiologists. A goal for all diabetes educators should be to meet the academic, professional, and experiential requirements to become a certified diabetes educator (CDE).¹²

However, the CDE credential does not allow health care professionals to practice outside of their professional scope of practice. While this may sound contradictory, it is best summed up by the AADE's statement: "The role of the diabetes educator is multidimensional, with boundaries for accountability that interface with other members of the healthcare team. This role involves the education of people with diabetes, their families, and appropriate support systems, as well as other healthcare professionals who do not specialize in diabetes management, such as policy makers and the public. A multidisciplinary team approach is the preferred delivery system for diabetes education. This specialty practice can occur successfully in a wide variety of settings and formats."¹²

Reimbursement for diabetes educators providing DSMT is available for programs that meet insurance industry standards. While these are subject to change, currently all ADA-recognized education programs can submit for insurance coverage. The education services required to assess, design, implement, and measure the exercise prescription are all well within DSMT standards and guidelines.

Professional Resources

Evidence-based research is the cornerstone of good medical care. Fortunately, there are some well-written, peer-reviewed resources that interpret the research to provide the latest health information and fitness guidelines for patients with diabetes. Following are a few of the resources that are known to the authors and are well respected in the exercise or diabetes fields:

- **ACSM**
 - ▶ *Exercise Management for Persons with Chronic Diseases and*

Disabilities. Champaign, Ill., Human Kinetics, 2003

- ▶ *ACSM's Guidelines for Exercise Testing and Prescription*. 6th ed. Franklin BA, Ed. Baltimore, Md., Lippincott, Williams & Williams, 1999
- **American Diabetes Association**
 - ▶ *Handbook of Exercise in Diabetes*. Ruderman N, Devlin JT, Schneider SH, Kriska A, Eds. Alexandria, Va., American Diabetes Association, 2002
 - ▶ Sigal RJ, Kenny GP, Wasserman DH, Castaneda-Sceppa C: Physical activity/exercise and type 2 diabetes (Technical Review). *Diabetes Care* 27:2518–2539, 2004
- **American Association of Diabetes Educators**
 - ▶ Physical activity/exercise. In *A Core Curriculum for Diabetes Educators: Diabetes Management Therapies*. 5th ed. Franz M, Ed. Chicago, American Association of Diabetes Educators, 2003

In addition to written materials, there are organizations that offer opportunities for diabetes educators to contribute, learn, and explore new resources and treatment strategies for diabetes and exercise. Again, here are a few such organizations with which the authors are familiar and which are well respected in the diabetes community:

- Professional section members of the ADA can opt to join its Council on Exercise. This council provides a forum for members to discuss the benefits, risks, and practical problems related to exercise for patients with diabetes and related disorders. It also offers mechanisms for disseminating new information about the effects of exercise to both the medical and general communities and assists in establishing national standards for the development of safe and effective exercise programs. ADA membership information is available online (www.diabetes.org).
- Active members of the AADE can choose to join its Physical Activity Specialty Practice Group (SPG). This is a group of multidisciplinary diabetes educators attempting to increase awareness of and provide guidance for physical activity as a means of diabetes prevention and treatment. Its members are committed to identifying, perpetuating,

and upholding the core competencies required by diabetes educators in determining the appropriate and safe exercise prescription. AADE members can learn more about this SPG in the Members section of the organization's website (www.diabeteseducator.org).

- The Diabetes and Exercise Sports Association (DESA) exists to enhance the quality of life of people with diabetes through exercise and physical fitness. The membership base is made up of people with diabetes and health professionals in diabetes who have an interest in physical activity. Three levels of membership are available: General, Youth (for individuals under the age of 18 years), and Professional. Complete membership information is available online (www.diabetes-exercise.org).

Summary

The exercise prescription for patients with diabetes can involve a multitude of tasks, volumes of evidence-based information, and interdisciplinary involvement of the health care professionals concerned with their care. That said, the outcome of all of this time and knowledge may result in no more than a simple walking program for patients to perform. Yet patients deserve nothing less than this collective effort. The potential risks of beginning an exercise program often have to be balanced with the presence of other diseases, diabetes complications, and medication regimens. With the assistance of trained and informed diabetes educators, patients can be assured, motivated, and confident that they are spending their time effectively and in harmony with their overall diabetes goals.

So where can one find a clinical exercise professional who wants to be part of an interdisciplinary team of diabetes educators? To be honest, they are few and far between. There have never been more than a few dozen CDEs who have listed as their primary job either physical therapist or exercise physiologist. Within the greater diabetes community, the challenge is to evaluate the missing links in existing programs and determine if there is a role for such a team member. Programs that now exist without an exercise specialist can look to their institution's cardiopulmonary rehabilitation program or physical therapy department to recruit a clinical exer-

cise professional that could provide DSMT expertise. With mentoring from other diabetes educators, this professional could accumulate the practice experience hours required to move toward the CDE examination, provide an added value to the delivery of the DSMT program, and offer a competitive edge by providing a unique skill set to the team.

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