



Continuing Education



Diabetes management guidelines

Learning Objectives

Describe diabetes management guidelines pertaining to exercise.

Explain the role of insulin in treating patients with type 2 diabetes.

Describe the general guidelines for using oral antidiabetic agents and combination therapy in the treatment of type 2 diabetes.

Describe diabetes management guidelines pertaining to special patient populations.

This second article in a three-part series describes diabetes management guidelines pertaining to medical nutritional therapy, exercise, insulin therapy, oral diabetic agents and combination therapy. Specialized guidelines pertaining to certain patient populations and circumstances are also discussed.

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Key aspects of guidelines for managing patients with type 1 and type 2 diabetes focus on medical nutritional therapy, exercise, insulin therapy, oral diabetic agents and combination therapy.

Medical nutritional therapy

The American Diabetes Association recommends that patients with diabetes receive medical nutritional therapy (MNT) to achieve treatment goals. The dietitian must address individual nutritional needs and treatment considerations, personal and cultural preferences, and the lifestyle of the patient. A successful meal plan must take into account factors such as the individual's level of physical activity, presence of other medical problems (e.g., hypertension) and socioeconomic status. According to the ADA, nutritional programs should be designed with the following goals in mind:

- Maintenance of blood glucose levels as near normal as possible by balancing food intake with insulin or oral medications and exercise

- Achievement of optimal serum lipid levels (LDL cholesterol, HDL cholesterol and triglyceride levels)
- Provision of adequate calories for maintaining or attaining reasonable weights for adults and normal growth and development in children and adolescents
- Prevention and treatment of the chronic complications and comorbidities of diabetes
- Improvement of overall health through healthy food choices and physical activity.

A variety of meal-planning approaches are available for patients with diabetes. The most common include exchange lists; high-carbohydrate, high-fiber plans; individualized menus; and counting systems.

An exchange list offers a comprehensive guide that provides a list of measured foods of approximately the same nutritional value within each of six categories. For any given meal, any one food portion on the list can be exchanged for another portion within the same category.

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The high-carbohydrate, high-fiber plan is an exchange-based meal program that uses eight food groups instead of six and emphasizes the fiber content of foods. This diet is used to treat a variety of metabolic diseases, including diabetes, hyperlipidemia, obesity, and hypertension.

With individualized menus, a diabetes educator helps the patient develop menus for a number of days. These are often used for patients unprepared or unwilling to select a healthy regimen on their own, preferring instead to work from preplanned daily menus.

There are also a number of counting systems for diabetic patients. These methods include:

- Calorie counting (appropriate for obese patients with type 2 diabetes)
- The total available glucose (TAG) system, which allows patients to monitor foods in terms of their conversion to glucose and subsequent metabolism
- Point systems, which offer a simplified method for patients to monitor calories and other dietary factors
- Carbohydrate counting, which is used to adjust regular insulin in meal planning.

Exercise

Current clinical reviews indicate that physical activity may be a valuable therapeutic tool in patients with diabetes or those at risk for diabetes. The diabetes healthcare team, consisting of (but not limited to) a physician, nurse, dietitian, mental health professional and pharmacist, and patient should work with an individual trained in exercise physiology.

Prior to beginning an exercise program, the person with diabetes should be screened for macrovascular and microvascular complications that may be worsened by exercise. A medical history and physical examination should look for symptoms and signs of disease affecting the heart and blood vessels, eyes, kidneys, feet, and nervous system.

The individual should prepare for the exercise program with an appropriate warm-up period to prepare the skeletal muscles, heart, and lungs for a progressive increase in the intensity of exercise. The ADA also recommends a cool-down period following an exercise session to bring the individual's heart rate down to its pre-exercise level.

Additional precautions for individuals with diabetes engaging in an exercise program include:

- Using silica gel or air mid soles and polyester or blend socks to prevent blisters and keep feet dry
- Monitoring for blisters and other potential damage to feet before and after physical activity
- Wearing a diabetes identification bracelet or shoe tag that is clearly visible
- Adequate hydration prior and maintaining hydration during exercise.

All levels of physical activity can be performed by individuals with type 1 diabetes who do not have complications and who have good blood glucose control. The ADA fully endorses the important role of the patient in collecting self-monitored blood glucose data of the response to physical activity, and then using the data to improve performance and enhance safety.

For patients with type 2 diabetes, exercise training, including endurance and resistance training, is one of the most important components of medical management. The benefits of exercise on glycemic control are well documented, and the benefits related to cardiovascular health are gaining more

Physical activity may be a valuable therapeutic tool in patients with diabetes or those at risk of diabetes

attention. Individuals with prediabetes or metabolic syndrome may be able to prevent or delay the progression of diabetes by adjusting their lifestyles through nutrition and exercise programs.

Insulin therapy

The primary goal of any insulin regimen should be to maintain nearly normal glucose levels at all times and minimize disruption in the lives of patients with diabetes. The long-term objective of near normal (euglycemic) glucose control is to prevent or delay the onset of diabetic complications, such as retinopathy, nephropathy and microvascular complications. A more immediate (i.e., daily) objective of an insulin regimen is to prevent the symptoms of diabetes, such as polydipsia, polyphagia and polyuria, without causing hypoglycemia.

Individuals with type 1 and type 2 diabetes have widely varying insulin requirements and lifestyle considerations. These considerations can change frequently over time.

Type 1. Traditionally, one of the most frequently used insulin regimens for patients with type 1 diabetes has been the once-daily injection of intermediate-acting insulin. However, in patients with well-established type 1 diabetes, a single injection per day of an intermediate-acting insulin to achieve today's goals is always insufficient. Two injections per day is probably the minimum number, while most require at least three or even four daily injections. Depending on the individual's ability to adjust doses of insulin to compensate for various meals, the multidose regimen offers good

glycemic control and flexibility of lifestyle.

Both internal and external continuous subcutaneous insulin infusion (CSII) devices can be programmed to release small amounts of insulin and bolus doses on an as-needed basis. Subcutaneous access is achieved by a catheter, inserted with a small needle. These pumps offer the potential for tight control and maximal flexibility of lifestyle for healthcare providers and patients who are motivated to learn about the functioning and maintenance of a CSII device.

Type 2. About 40% of individuals with type 2 diabetes will eventually require insulin therapy. In addition, some will have high blood glucose levels at the time of diagnosis and require initial therapy with insulin to quickly lower them before beginning a regimen of diet and exercise. Patients with type 2 diabetes may achieve reasonable glycemic control with one injection of intermediate-acting or long-acting insulin daily because they may have some residual pancreatic insulin responsiveness to glucose in meals. However, depending on the

patient's condition, the physician may prescribe a two-dose or three-dose insulin injection regimen to maximize glycemic control.

Other therapeutic options

Differing drug characteristics may make certain oral agents more sensible for some patients with type 2 diabetes. For example, a need for quick results or a low cost would suggest treatment with a sulfonylurea. Patients who are overweight may do well on metformin. Those who exhibit postprandial hyperglycemia may benefit from the α 1-glucosidase inhibitor acarbose, while thiazolidinediones may be good choices in patients who are highly insulin-resistant and have not had success with monotherapy using other types of oral agents.

Within a few years of diagnosis, more than 50% of patients with type 2 diabetes will need to be treated with a combination of agents to achieve glucose goals. Each agent in the combination may be administered singly as an oral formulation or injection.

A combination therapy can be a combination of

Summary of guidelines for managing diabetes

Type 1 diabetes

Medical nutritional therapy

- Individualized program based on desired outcomes
- Therapy focuses on maintenance of blood glucose levels and matching food intake to insulin levels

Exercise

- Individualized program involving patient in collecting and using self-monitored blood glucose data to enhance safety
- Promotes cardiovascular and muscle fitness
- Improves metabolic control

Insulin therapy

- Required
- Average, moderate or intensive regimen
- Aimed at achieving targeted blood glucose ranges

Type 2 diabetes

Medical nutritional therapy

- Individualized program based on desired outcomes
- Caloric intake aimed at weight loss, as appropriate

Exercise

- Promotes glycemic control and cardiovascular fitness in patients at risk for heart disease
- Promotes weight loss and maintenance
- Provides substantial benefits in treatment and prevention of diabetes and its complications

Oral agents

- Sulfonylureas
- Meglitinides
- Biguanides
- Thiazolidinediones
- α 1-glucosidase inhibitors
- Combination tablets
- DPP-4 inhibitors

Insulin therapy

- Alone or in combination with oral hypoglycemic agents

Injectable agents

- Pramlintide, combined with insulin
- Exanatide, combined with oral agents

- Combined regimen of diet/exercise may be adequate to lower blood glucose levels to target range

- Added if optimal blood glucose levels cannot be achieved with diet and exercise alone
- Combination oral agent therapy may be useful in patients who require tighter blood glucose control

- Added only if target blood glucose levels not achieved through diet, exercise and oral agents

- Patient education
- Initial evaluation and follow-up by diabetes management team
- Frequent daily glucose monitoring
- Regular medical exams to assess status of diabetic complications

one or more oral antidiabetic agents and insulin. Those patients who do not respond to therapy with oral agents alone may be treated with a dose of intermediate-acting or long-acting insulin in the evening in addition to their usual oral agent. Conversely, patients with type 2 diabetes already being treated with insulin who are not at goal may benefit from adding an oral agent to their regimen.

Since most patients with type 2 diabetes experience a gradual progression of disease, monotherapy with oral agents is of limited value. Thus, combinations of oral agents are becoming a common approach to therapy in patients with long-standing disease. This approach seems to be more effective than substituting a new drug for one that is no longer effective.

A combination therapy may also include one or more oral antidiabetic agents and the injectable agent exenatide. Exenatide, used in combination with an oral antidiabetic agent, is considered a second-line treatment.

The amylin analog pramlintide can enhance the effects of insulin when used in combination with insulin. It has been shown to reduce postprandial glucose increases, and it was also found to significantly reduce average 24-hour plasma glucose concentrations. However, it also increases the risk of insulin-induced severe hypoglycemia.

Different types of insulin also may be used as a combination therapy. Physicians may prescribe a combination of different types of insulin that can be mixed in a syringe or vial to help eliminate the need for an excessive number of injections. Some premixed insulins are available. The most commonly used premixed insulin combines an intermediate- and a short-acting insulin.

Special considerations

Certain patient populations and circumstances necessitate special guidelines.

Children and adolescents. Type 1 diabetes is the more common type of diabetes seen in children and adolescents. However, it is increasingly common to see type 2 diabetes in very young children who are obese and/or from some minority populations (i.e., primarily people of Hispanic, Native American and African American heritage). All patients with type 1 diabetes require therapy with insulin. Those with type 2 disease can typically be treated with oral medications, a healthy eating plan and exercise, with just a few patients requiring insulin. Disease management can be difficult in puberty due to changes in psychosocial, physiological, emotional, and developmental factors.

Pregnant women. Risks for women with gestational diabetes include a high rate of congenital malformations and maternal complications, such as hypertension, premature labor and delivery

Article Summary

- The ADA recommends that patients with diabetes receive medical nutritional therapy (MNT) to achieve treatment goals.
- Physical activity may be a valuable therapeutic tool in patients with diabetes or those who are at risk for diabetes.
- The primary goal of any insulin regimen should be to maintain nearly normal glucose levels at all times and minimize disruption in the lives of patients with diabetes.
- Other therapeutic options include oral antidiabetic agents and combination therapy.
- Certain patient populations and circumstances necessitate special guidelines.

by cesarean section. There are two primary nutritional considerations for pregnant women with diabetes. First, weight loss should be avoided. Second, glucose levels should be rigidly controlled. Insulin is the only approved treatment as a blood glucose-lowering agent in pregnant women with diabetes, as the effects of oral antidiabetic agents on the fetus have not been adequately evaluated.

Elderly patients. As individuals age, their challenges include a gradual and progressive decline in organ function that may be more pronounced in patients who have not remained physically fit or who have not maintained good nutrition. These changes in organ function may alter drug absorption and distribution so that plasma levels of drugs are reduced, along with their effects. Furthermore, insulin injections and blood glucose monitoring may be difficult when vision and dexterity are declining.

Management during minor illnesses. Illness or stress increases the risk of hyperglycemia and ketosis, and since it may be difficult to eat during illness, hypoglycemia can occur. Gastrointestinal illness can cause vomiting and an inability to take fluids, resulting in dehydration. The occurrence of hypoglycemia or the combination of dehydration and ketosis requires immediate and aggressive action.

Patients undergoing surgery. Poor metabolic control is associated with impaired response to infection, poor wound healing, increased protein breakdown and electrolyte imbalances. Surgery and recovery from anesthesia increase the risk of hypoglycemia, ketosis and insulin requirements. Frequent monitoring of laboratory parameters helps to keep the patient in metabolic balance.

The final article in the series will focus on diabetes management services.