

## Diabetes

### Taking charge of your health

You've reached the stage in life when you can spend more time with family and friends doing the things you enjoy. But as you age, worries about your health can sometimes creep in. You've noticed that more of your friends are dealing with diabetes, and you wonder if you could be next. Fortunately, there are actions you can take to significantly lower your risk of developing type 2 diabetes, the most common form of diabetes.

That's a good thing because diabetes is on the rise. The Centers for Disease Control and Prevention estimates that diabetes affects nearly 26 million Americans, including children, adolescents and adults. The number has been increasing in recent years in large part due to the rising rate of obesity among Americans. Extra weight and a sedentary lifestyle can increase your chances of developing type 2 diabetes. The risk of diabetes also increases with age. At least 1 in 5 Americans age 65 and older has the disease.

The good news is that you can take charge when it comes to type 2 diabetes. By mapping out a plan that includes maintaining a healthy weight, a healthy diet and physical activity, you can help prevent or manage the disease. And if you already have diabetes, advances in treatment can help prevent serious problems from the disease and allow you to enjoy a full and satisfying life.

### What is diabetes?

The term *diabetes* refers to a group of diseases that affect the way your body uses blood sugar (glucose). If you have diabetes it means you have too much glucose in your blood. Too much glucose can eventually result in serious health issues. There are two main types of diabetes. Type 1 occurs when the pancreas makes very little or no insulin. It most often develops in childhood or adolescence. Type 2 occurs when your cells are resistant to the insulin your pancreas makes. Exactly why insulin resistance happens is uncertain, although excess weight and fatty tissue seem to be important factors.

Glucose is vital to your health because it's the main source of energy for the cells that make up your muscles and tissues. Most glucose comes from carbohydrates in foods you eat. During digestion, chemicals in your stomach break down carbohydrates into glucose. The glucose is then absorbed in your bloodstream. Your pancreas, an organ near your stomach, responds to the presence of glucose by releasing a hormone called insulin. Insulin is like a key unlocking the door to your cells so that the glucose can enter. Once the glucose enters your cells, the amount of glucose in your bloodstream falls. ▶



## Types of diabetes

There are several types of diabetes, each with different causes. Some of the main types of diabetes include:

- *Type 1* — This form of diabetes occurs when the pancreas makes very little or no insulin. Type 1 diabetes is an autoimmune disease that most often develops in childhood or adolescence, although it can also occur in adulthood. Between 5 and 10 percent of people with diabetes have type 1.

- *Type 2* — Between 90 to 95 percent of people with diabetes have type 2. If you have type 2 diabetes, your pancreas makes insulin, but your cells are resistant to it. A sedentary lifestyle, age and race are other risk factors for insulin resistance.

- *Gestational* — The onset of this type of diabetes usually occurs late in pregnancy. Glucose levels often return to normal after the baby is born, but about half of all women who experience gestational diabetes develop type 2 diabetes later in life.

- *LADA and MODY* — Latent autoimmune diabetes in adults (LADA) is a rare form of type 1 diabetes that develops slowly over many years in adults. Maturity-onset diabetes of youth (MODY) is an uncommon form of type 2 diabetes caused by a defect in a single gene.

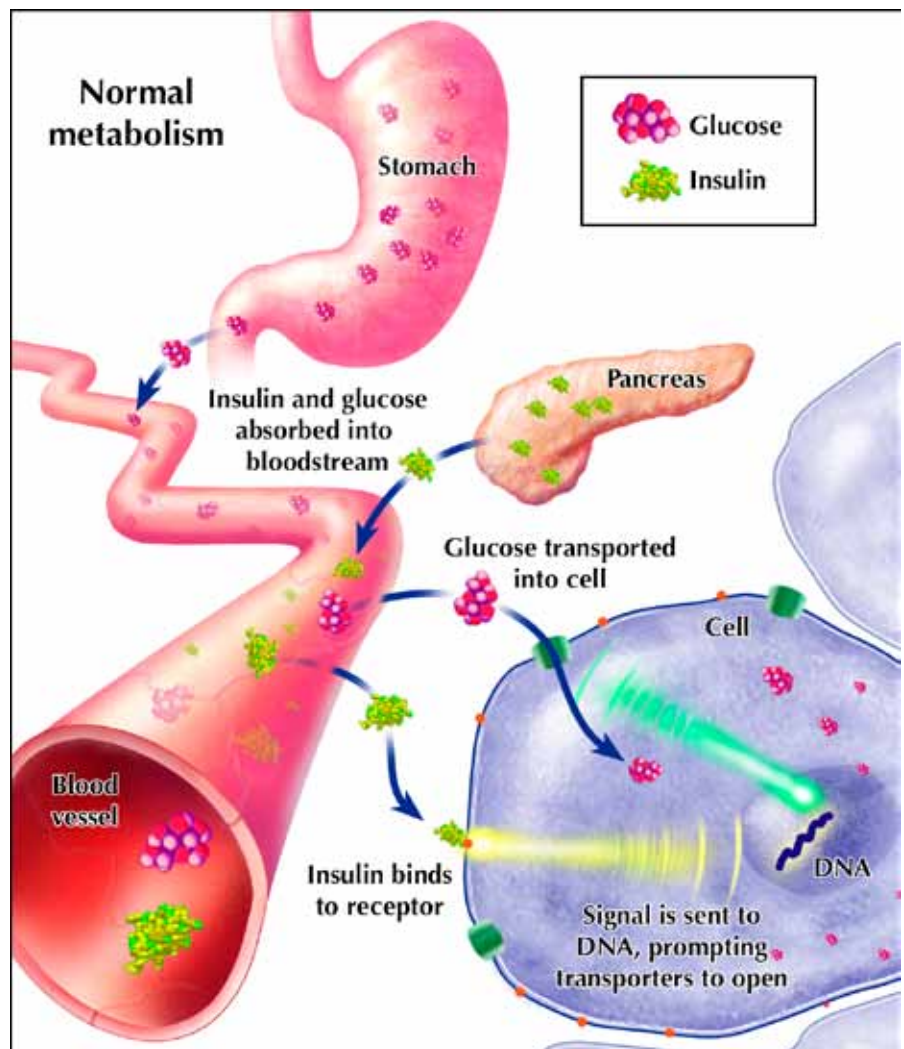
When you have diabetes, your body can't produce enough insulin or it can't use insulin properly. When that happens, the glucose in your bloodstream is unable to enter your cells. That results in a potentially dangerous buildup of glucose in your bloodstream.

Most of the symptoms of diabetes result from this buildup of glucose. With type 2 diabetes, these symptoms tend to develop slowly over a long period of time. Often they are mild or even unnoticeable. Over time, though, untreated diabetes can lead to serious complications such as heart disease, kidney damage, stroke or eye problems.

The most common symptoms of diabetes are excessive thirst and a frequent need to urinate. Other signs and symptoms include weight gain or loss, increased hunger, fatigue, blurred vision, slow-healing sores or frequent infections, and tingling feet and hands.

## Long-term complications

Many people with type 2 diabetes don't find out they have the disease until they've developed long-term complications. With the proper treatment and management of the disease, many of these complications can be prevented or delayed:



- *Heart and blood vessel disease* — This set of health conditions is also known as cardiovascular disease, and it's the leading cause of death among people with diabetes. It can result in narrowing of the arteries and lead to chest pain and heart attack.
- *Stroke* — Cardiovascular disease can also cause strokes. A stroke occurs when the blood supply to part of your brain is interrupted or severely reduced. When brain tissue is deprived of oxygen and nutrients, brain cells begin to die.
- *Nerve damage* — High blood glucose levels can lead to nerve damage, also known as diabetic neuropathy. Neuropathy most commonly occurs in your limbs, especially your legs. This can be painful and debilitating, though symptoms are often mild. The risk of nerve damage increases with age and the duration of your diabetes.
- *Eye damage* — Eye damage, also known as retinopathy, is a common complication of diabetes. Nearly everyone with type 1 diabetes and more than 60 percent of people with type 2 diabetes develop some form of eye damage by the time they've had diabetes for 20 years. Most often, signs and symptoms are mild, but some people suffer from distorted vision or even blindness.
- *Kidney disease* — Up to 40 percent of people with diabetes eventually develop kidney disease, also called diabetic nephropathy. Over time, nephropathy can cause your kidneys to stop working properly.
- *Foot problems* — Nerve damage and poor blood flow increase the risk of various foot complications. Left untreated, cuts and blisters can become serious infections. Severe damage might require toe, foot or even leg amputation.

## Preventing diabetes

Some risk factors for type 2 diabetes — such as your age — you can't control. Fortunately, some of the most common risk factors are ones you can do something about. Chief among these is your weight. More than 80 percent of people with type 2 diabetes are overweight or obese. A sedentary lifestyle and poor diet also can contribute to the development of type 2 diabetes.

A few key lifestyle changes can significantly reduce your risk of developing type 2 diabetes. These changes center on moderate weight loss through a healthy diet and exercise. A major study known as the Diabetes Prevention Program found that older adults, in particular, can benefit from these healthy habits. Study participants age 60 or older reduced the risk of their prediabetes (insulin resistance) progressing to diabetes by 71 percent. To achieve that goal, the participants lost 5 to 7 percent of their body weight, ate a healthy diet, and increased their physical activity.

Changing your eating and exercise habits to lose weight may seem daunting, but it's well worth the effort. And it's never too late to start. In fact, research has shown that older adults seeking to prevent diabetes have better success in achieving exercise and weight-loss goals than do their younger counterparts. You, too, can take charge of your health.

## Getting on track with your weight

The rise in the number of Americans with type 2 diabetes parallels the rise in the number who are overweight or obese. Excess weight affects your body's ability to use insulin, leading to insulin resistance. This is especially true if fatty tissue is concentrated around your abdomen rather than on your hips and thighs.

On its own, insulin resistance doesn't cause type 2 diabetes, but it significantly increases your risk of developing the disease. When you're insulin

## Should I be tested?

It's estimated that more than 25 percent of people with diabetes don't know they have the disease. That number is even greater among older adults. Nearly 1 in 3 people with diabetes who is 65 and older may be living with the condition, but unaware of it. Rather than find out you have diabetes when serious complications arise, it's a good idea to get tested on a regular basis.

If you're younger than 45, the American Diabetes Association recommends that you be tested at least every three years if you're overweight and have one or more additional risk factors. If you're 45 or older, the recommendation is to be tested at least every three years, regardless of your weight or other risk factors. That's because age is one of the risk factors for type 2 diabetes. Older adults are more likely to develop a resistance to insulin and impaired functioning of the pancreas, which produces insulin. Other risk factors for diabetes are:

- Being overweight or obese
- Leading a sedentary lifestyle
- A family history of diabetes among first-degree relatives, such as a brother, sister or parent
- Being of African-American, Alaska Native, American Indian, Asian-American, Hispanic-Latino or Pacific Islander American descent
- A history of gestational diabetes or giving birth to at least one baby over 9 pounds
- High blood pressure
- High-density lipoprotein (HDL) cholesterol level below 35 milligrams per deciliter (mg/dL) or a triglyceride level above 250 mg/dL
- Polycystic ovary syndrome
- A history of cardiovascular disease



## Managing glucose levels

Blood glucose fluctuates throughout the day. Influencing factors include:

- **Food** — Your blood glucose is highest one to two hours after a meal, and then it starts to fall. Try to keep a consistent eating schedule. Eating at the same times each day and controlling how much you eat will help you control the times your blood glucose is higher and how high your blood glucose rises.

- **Physical activity** — Exercise and physical activity tend to lower your blood glucose level. Less commonly, exercise can raise blood glucose.

- **Medications** — Both insulin and oral diabetes medications lower blood glucose. Medications taken for other conditions also can affect blood glucose levels. Let your doctor know you have diabetes before being prescribed a new medication.

- **Illness** — When you're sick, injured or have a serious health problem such as a heart attack, it's important to monitor your blood sugar more frequently. Your body produces stress-related hormones to help fight the illness. These hormones can raise your blood glucose.

- **Alcohol** — Alcohol can cause low blood sugar if you take insulin or oral diabetes medications. If you do drink alcohol, do so in moderation and never drink on an empty stomach if your blood sugar is low.

- **Stress** — Stress can influence how much you exercise and eat, which can affect your blood glucose. Stress may also cause your body to produce hormones that prevent insulin from working properly. If you notice that stress is making it harder to control your glucose, try taking up a mind-body therapy such as meditation, yoga or tai chi. If your stress is still a problem, talk to your doctor.

resistant, your body produces more insulin to compensate for the problem, but it's often still insufficient to overcome the resistance. Eventually, the amount of glucose in your blood begins to increase, leading to diabetes. Thankfully, weight loss can help reverse this process by allowing your cells to become more responsive to insulin.

Even a modest weight loss of 5 to 10 percent of your body weight can be beneficial. In a 200-pound person, that equals 10 to 20 pounds. Still, there's no denying that losing weight can be challenging. Key changes to your diet and exercise habits — along with a positive attitude — can help you reach your goals. The extra effort will not only help prevent diabetes but also provide other benefits, such as improved heart health, increased energy levels and better self-esteem.

## Healthy eating

A healthy diet can help you lose weight and promote better blood glucose control. But eating well isn't just about how many calories you consume. It's also about enjoying a variety of foods that meet your body's needs. The three main nutrients your body relies on are carbohydrates, protein and fats. The trick is getting the right amount of each. Try following these suggestions:

- **Try the plate method** — Figuring out what to eat at mealtime doesn't have to be complicated. The plate method is a simple tool you can use to plan healthy meals. Imagine drawing a line down the middle of your plate. Fill half of it with nonstarchy vegetables. These include most vegetables except potatoes, lentils, corn, peas or winter squash. Fill another quarter of your plate with meat or meat substitutes. These include everything from beef, pork, fish and poultry to eggs, cheese, peanut butter and tofu. The remainder of your plate can be reserved for a carbohydrate. Carbohydrates high in fiber, such as whole-grain pasta or bread, brown rice, potatoes, or beans, are best for diabetes prevention and general health. Complete your meal with a serving of fruit, a serving of milk or yogurt, or both.

- **Limit saturated and trans fats** — Fat is vital to the life and function of your cells. It's also the most concentrated source of food energy, which means a little can go a long way. As much as possible, try to avoid foods and oils made with saturated fat or trans fat. These fats can raise total and low-density lipoprotein (LDL, or "bad") cholesterol and are found in foods such as butter, lard and partially hydrogenated oils. Instead, look for monounsaturated fats ("good fats") that can help lower total and LDL cholesterol. They're found mainly in olive, canola and peanut oils, as well as most nuts and avocados. Look for lean cuts of meat, avoid fried foods, and choose fat-free or low-fat dairy products, salad dressings, and spreads.

- **Change it up** — Variety is the spice of life and a key part of a healthy diet. People who make a habit of eating meals made with a variety of healthy ingredients reduce their risk of developing diabetes or complications from the disease. A varied diet can also help prevent many other diseases, including heart disease, many kinds of cancers, and age-related vision loss and osteoporosis.

## Be active

Physical activity is another important component of weight loss and can aid in diabetes prevention. Research shows that exercise can lower your blood sugar and improve your body's ability to use insulin. Being active also helps keep your heart and bones strong, improves flexibility, lowers your risk of falling, and reduces stress. *(Continued on page 6.)*

## Strengthening exercises

No matter how well you take care of yourself, age will take a toll on the amount and quality of muscle in your body. But don't give up hope and blame declining strength all on getting old. Studies have found that only about 30 percent of the difference in strength between young adults and older adults is due to aging. That means about 70 percent of the strength people lose is related to other factors, most notably a decline in exercise and physical activity.

### Squats

Stand in front of a chair with your feet slightly more than shoulder-width apart. Extend your arms out in front of you. Slowly bend through the hips, knees and ankles. Lower yourself until you reach a near-sitting position, or as far as is comfortable. Be sure to keep your knees in line with your feet and not ahead of your toes. Pause and return to standing.



### Wall or table pushups

Lean on a wall or table as shown. Slowly bend your elbows and lean your upper body toward the wall or table, supporting your weight with your arms and keeping your heels on the floor. Straighten your arms and return to the starting position.



### Toe stands

Stand near a counter or chair with your feet shoulder-width apart. Counting to four, slowly push up onto the balls of your feet. Hold for two seconds and then slowly lower your heels to the floor as you count to four.



This loss of strength doesn't have to occur — and if it already has, the loss can be regained. Older adults often experience remarkable improvement in strength within weeks or months of starting a strength training program. Aim to do a variety of strengthening exercises at least two days a week. The exercises should work all the major muscle groups. If you're just starting out, here are some beginner exercises to try:

## Weight-loss tips

If you're considering losing weight, here are some steps you can take to increase your odds of success:

- *Determine whether you need to lose weight* — At your next doctor's visit, discuss your weight with your physician. Your body mass index (BMI), waist circumference and medical history can indicate whether weight loss is warranted.

- *Make sure you're ready* — Losing weight takes commitment and perseverance. If you try to lose weight before you're ready, you could be setting yourself up for failure. Take some time to assess your level of readiness before setting off on a weight-loss plan.

- *Set SMART goals* — SMART stands for specific, measurable, attainable, relevant and time-limited. It means starting off with small, reasonable goals and a concrete plan for how to achieve those goals. For example, rather than telling yourself you want to lose 15 pounds, set a more specific goal. It might be doing muscle-strengthening exercises two days a week or adding more whole grains to your diet. Track your progress by writing everything down in a log. As you begin to succeed in reaching your initial goals, add on more-challenging ones. On the other hand, if you're struggling with your weight-loss plan, it's OK to reassess and make adjustments.

- *Be prepared for bumps in the road* — It takes time to form new habits, and you may experience some setbacks along the way. If you get out of your exercise routine or indulge in one too many desserts, it's not the end of the world. You can learn from your mistakes and get back on track. The important thing is to keep going.

If you're generally fit and have no limiting health conditions, aim for a weekly combination of aerobic and strengthening exercises. The recommendation for adults is to do at least 30 minutes of aerobic exercise five days a week and strengthening exercises at least two days a week.

Aerobic exercise is movement that increases your breathing and heart rate. Walking, jogging, swimming, dancing and cycling are all good examples. Whatever you choose, make sure it's something you enjoy. You'll be less likely to stick with an activity if it feels like a chore. Keep in mind, too, that you don't have to complete all 30 minutes at once. Shorter sessions of aerobic exercise throughout the day work just as well.

Regardless of what physical activities you choose, it's a good idea to do some stretching exercises before and after exercise. Stretching can help prevent joint pain and injury.

What if you have ongoing health problems that make certain exercises difficult? You can still find ways to be active. Research shows that physical activity is both safe and beneficial for people with chronic conditions such as arthritis and osteoporosis. Ask your doctor or physical therapist what might work best for you. By the same token, if you haven't exercised much and you want to get started on an exercise program, talk to your doctor before you begin. Then start slowly, setting reasonable goals as you go.

## How is diabetes diagnosed?

An international committee of experts from the American Diabetes Association, the European Association for the Study of Diabetes and the International Diabetes Federation recommends that type 1 and type 2 diabetes testing include any of these four blood tests:

- *A1C test* — This test, also known as the glycated hemoglobin test, measures the percentage of glucose that's attached to hemoglobin, a protein in red blood cells that carries oxygen. An A1C level between 5.7 and 6.4 percent indicates that you have prediabetes. A result of 6.5 percent or higher on two separate tests indicates that you have diabetes.

- *Random blood glucose* — This test measures the amount of glucose in a sample of your blood. If your level is above 200 milligrams of glucose per deciliter of blood (mg/dL) regardless of the time of your last meal and you're experiencing signs and symptoms of diabetes, you can expect a diagnosis of diabetes.

- *Fasting blood glucose* — The preferred way to test your blood glucose is after a fast lasting eight hours or overnight. A fasting blood glucose level between 100 and 125 mg/dL indicates that you have prediabetes, while a level of 126 mg/dL or higher on two separate tests is indicative of diabetes.

- *Oral glucose tolerance* — This less commonly used test requires at least an eight-hour fast. It involves drinking a sweet liquid containing about 75 grams of sugar. After one hour and again after two hours, your blood is taken to measure your glucose level. A level of 200 mg/dL or higher means that you have diabetes, while a level between 140 mg/dL and 199 mg/dL indicates prediabetes.

## Monitoring your blood sugar

If you have diabetes, controlling your blood glucose level is the single most important thing you can do to feel your best and prevent long-term complications. One important way to achieve this goal is by monitoring your blood glucose. Blood glucose tests are performed with a glucose monitor, a portable electronic device that measures glucose levels in a small drop of your blood.

It's vital to keep a log of your results. This will help you determine if you're on track and can also be invaluable information for your doctor. You want your blood glucose to stay within a desirable range — not too high or too low. This range is often referred to as your target range or your blood glucose goal. The normal range for a fasting blood glucose level is 70 to 100 mg/dL. But that's not realistic for most people with diabetes. Your health care provider will likely personalize your blood glucose target based on your age and any specific medical conditions.

People with type 1 diabetes must test themselves multiple times a day. The same is likely true if you have type 2 diabetes and are taking insulin. If you have type 2 diabetes and don't need insulin or diabetes medication, you won't need to test as often. For some people, daily testing is necessary, while for others, testing twice a week may be sufficient. Your doctor can help you determine how frequently to test your glucose levels.

Keep in mind that you may not hit your blood glucose target each time. Rather than get caught up in the numbers game, focus on how you're doing overall. If you notice a pattern of results that are too low or too high, talk to your doctor about changing your treatment plan.

## Treatment for type 2 diabetes

A diagnosis of type 2 diabetes doesn't mean an end to the food and activities you love. What it does require is a commitment to a healthy lifestyle, one that can have a big impact on your current and future health. The same strategies that help prevent type 2 diabetes are also the best ways to treat the disease.

As with diabetes prevention, weight loss is an important treatment strategy. As mentioned earlier, even a modest weight loss of 5 to 10 percent of your body weight can improve your body's ability to use insulin properly and help keep your blood sugar levels in check.

Similarly, what you eat — and how much you eat — matters. Focus on centering your diet on healthy foods. These include high-fiber, low-fat foods such as vegetables, whole grains and smaller servings of lean meat and low-fat or fat-free dairy products.

Physical activity can also improve glucose control and decrease insulin resistance. The recommendation for adults is to get at least 150 minutes of aerobic exercise a week and to do strengthening exercises at least two days a week. If you haven't exercised for a while, you'll want to start slowly. It's also a good idea to talk to your doctor before you begin a new exercise plan.

Other lifestyle strategies for managing your diabetes include reducing stress and restricting how much alcohol you drink. Both stress and alcohol can negatively affect your blood glucose levels. And if you smoke, consider stopping. People with diabetes who smoke are at least twice as likely as nonsmokers with diabetes to die of cardiovascular disease, such as heart attack or stroke. People with diabetes who smoke are also more likely to develop circulation problems in their feet.

It's possible that even with these lifestyle changes, you'll still struggle to control your blood sugar levels. Your doctor may recommend one or more diabetes medications, insulin, or a combination of the two. Diabetes medications can help your body produce more insulin, control glucose levels or improve your body's ability to use insulin. Most diabetes drugs are taken orally, but a few can be injected. A detailed description of available diabetes drugs can be found in the cover article of our September 2014 issue.

## Don't take prediabetes lightly

If you have prediabetes, your blood sugar levels are higher than normal but not high enough to be classified as diabetes. The higher blood sugar is the result of insulin resistance. That means your body isn't able to use insulin effectively. Half of all Americans 65 and older are thought to have prediabetes due to insulin resistance. Yet only 7 percent of people with prediabetes are aware of their condition.

People with prediabetes are at increased risk of developing type 2 diabetes. Many develop the disease within 10 years. Prediabetes can also lead to the same complications as diabetes, including cardiovascular disease, stroke, kidney disease and eye damage. These problems can start to develop at the prediabetes stage.

If you have prediabetes, you should see your doctor regularly and take steps to control your blood glucose. Modest weight loss, a healthy diet and increased physical activity can help reverse the progression from prediabetes to diabetes.

Research suggests that among people 60 and older, weight loss, diet and physical activity are the most effective measures in preventing type 2 diabetes. Although the oral drug metformin (Glucophage, Fortamet, others) may slow or prevent the progression from prediabetes to diabetes, it's less effective in people older than 45.



## For more Information

American Diabetes Association, [www.diabetes.org](http://www.diabetes.org), can provide additional information about diabetes and diabetes prevention.

In addition, *Mayo Clinic The Essential Diabetes Book* is a comprehensive, full-color book to help you prevent and manage diabetes.

Learn more by visiting [www.store.mayoclinic.com](http://www.store.mayoclinic.com) or calling 877-647-6397 (toll-free) between 8 a.m. and 5 p.m. Central time, Monday through Friday, to order your copy.

Type 2 diabetes is a serious disease, but it can be prevented or managed if you're willing to do your part. The choices you make about your weight, diet and physical activity can have a significant impact. By taking an active role in your health, you can make the most of your todays and tomorrows. □

## Medical emergencies

Blood sugar levels that rise too high or low can cause medical emergencies. If left untreated, these conditions can lead to coma or even death. It's important to know the warning signs and what steps you can take if they develop:

**Low blood sugar (hypoglycemia)** — Hypoglycemia can occur when your blood glucose falls below 70 milligrams per deciliter (mg/dL). It's more common with type 1 diabetes but can happen if you have type 2 diabetes and are taking medications, including insulin.

- **Signs of hypoglycemia** — You feel sweaty, weak, shaky, hungry, dizzy, irritable or nauseated. Other signs and symptoms include visual disturbances, headache, fast heartbeat, cold and clammy skin, slurred speech, drowsiness, drunken behavior, or confusion.

- **What to do** — Eat or drink something that will raise your glucose level quickly, such as hard candy, a regular soft drink, fruit juice or glucose tablets. Make sure adult family members know how to treat hypoglycemia if you lose consciousness. They should be prepared to give you a shot of glucagon, a fast-acting hormone that stimulates the release of glucose into your blood.

**High blood sugar (hyperglycemia)** — A blood glucose level of 600 mg/dL or higher is known as hyperglycemic hyperosmolar state (HHS). Older adults with diabetes who don't get enough fluids are at particular risk of HHS.

- **Warning signs of HHS** — You experience leg cramps, dry mouth, a rapid pulse, frequent urination, seizures, dehydration, confusion or seizures.

- **What to do** — Call your doctor. If your blood sugar is 500 mg/dL or higher, see your doctor immediately or go to the emergency department.

**High ketones (diabetic ketoacidosis)** — Diabetic ketoacidosis (DKA) is a potentially fatal buildup of ketones in your blood. DKA is more common in people with type 1 diabetes.

- **Warning signs** — You have high blood glucose, excessive thirst, dry mouth, frequent urination, fatigue, blurry vision, nausea, confusion, vomiting, loss of appetite, abdominal pain, shallow breathing, weakness or a fruity odor on your breath.

- **What to do** — Test your urine for ketones. If you have a high ketone level, see your doctor immediately or go to the emergency department.