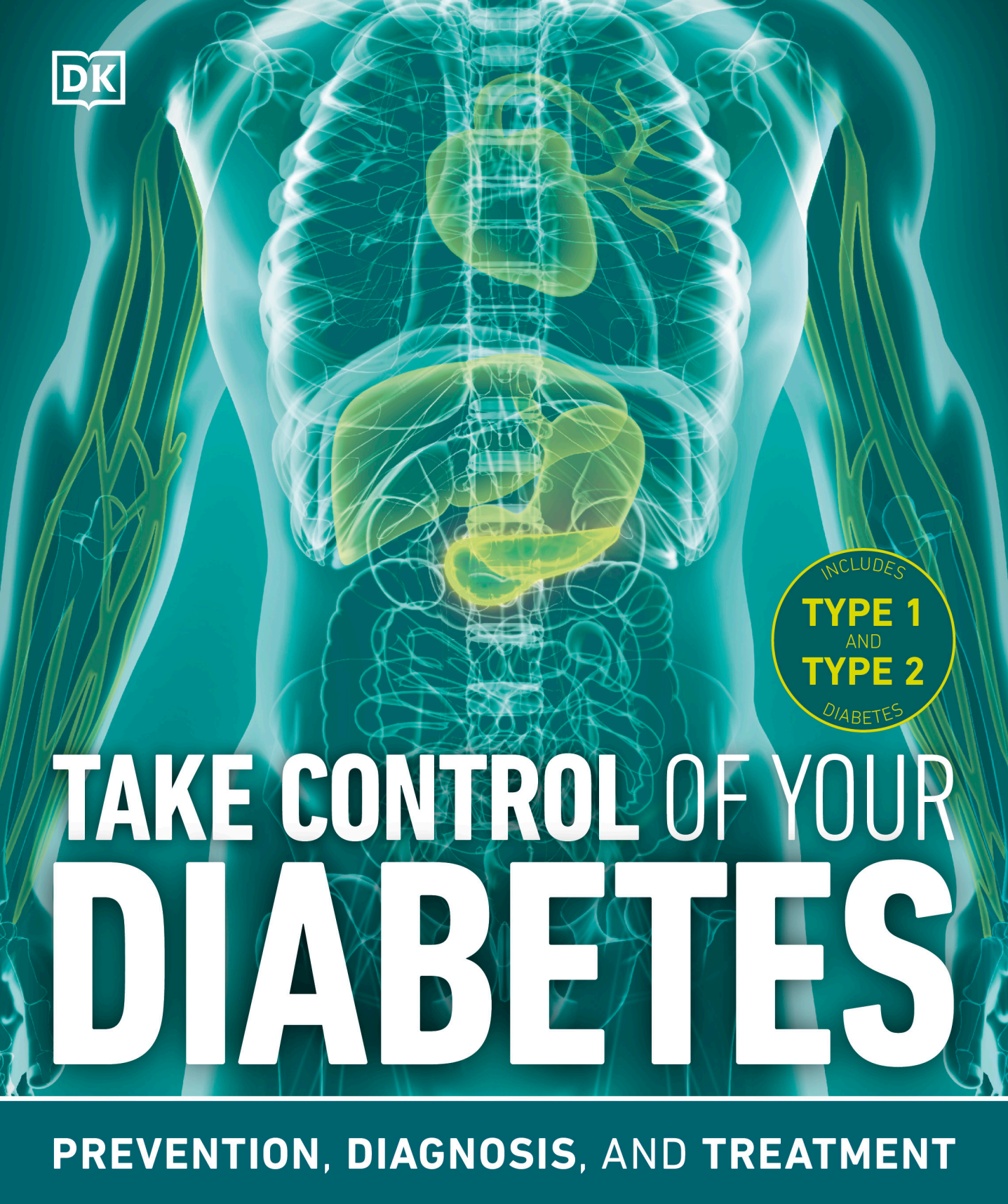
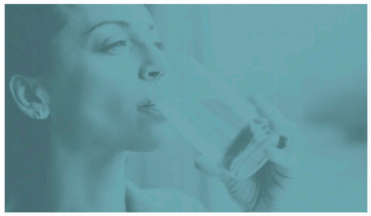

DK
INCLUDES
TYPE 1
AND
TYPE 2
DIABETES
TAKE CONTROL OF YOUR
DIABETES
PREVENTION, DIAGNOSIS, AND TREATMENT

TAKE CONTROL OF YOUR DIABETES

Rosemary Walker

Contents



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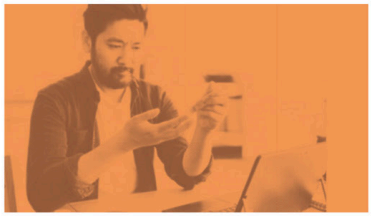

Managing your blood glucose

Eating, drinking, and being active

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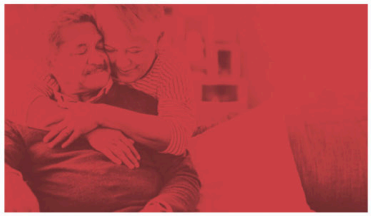

Living with diabetes

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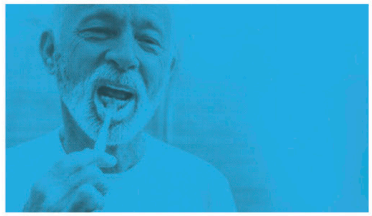

Dealing with complications

A note to Canadian readers: Blood sugar levels are measured in mmol/L in Canada. Please see pp.202–203 for blood glucose target recommendations from Diabetes Canada, as well as other specific information and resources.

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Foreword

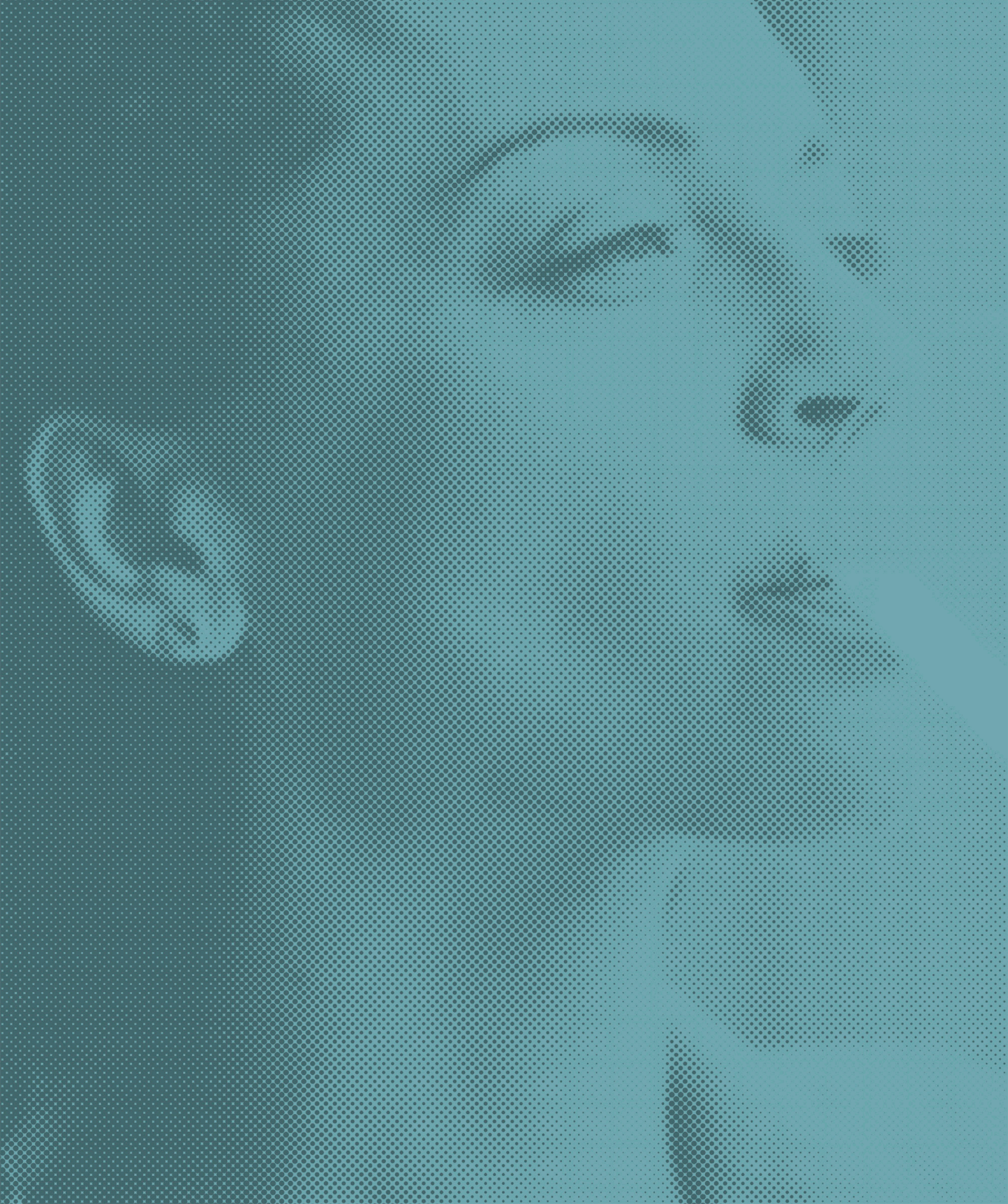
You are the expert in your own life. That is my firm belief that lies at the heart of this book. You can make decisions and choices that are right for you, supported by reliable diabetes resources, and empathic, nonjudgmental health professionals, who contribute their expertise in diabetes as a health condition.

Diabetes is not a "one size fits all" condition. Every individual experiences it differently, and there are various ways in which it can be treated and managed. In turn, the wider world of diabetes is continually revealing new research evidence and developing new technology to make managing the condition easier and more compatible with your everyday life. Particular attention is also being directed toward finding ways of preventing and curing diabetes, which are our ideal goals. I have tried to make this book reflect all of this, and to give you hope and reassurance.

Among the most important aspects of living with diabetes, the support and society of others who are also experiencing it can be an enormous help in coping with the practical burdens it brings and in staying or becoming emotionally healthy. Throughout these pages, I have tried to encourage everyone who wants to, to seek out the many opportunities available today to meet, share, and compare with others who live with diabetes. It can be a huge relief to know that you are not alone.

I wish you every success as you start or continue to live with diabetes.

Rosemary Walker



What is diabetes?

Understanding diabetes

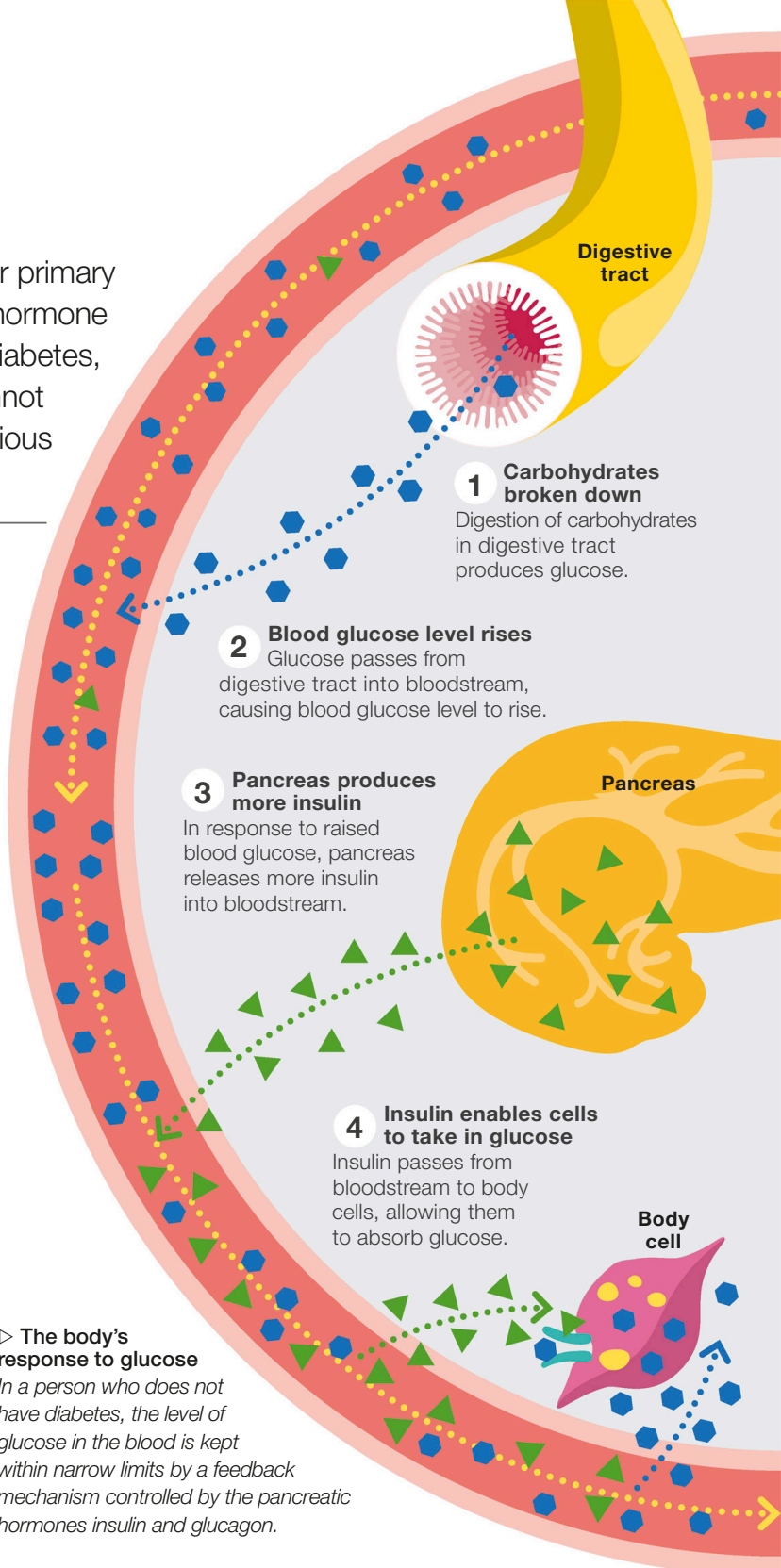
All your body cells need energy. Their primary source is glucose, which needs the hormone insulin in order to enter the cells. In diabetes, there is a lack of insulin or insulin cannot do its job properly, which causes various symptoms and health problems.

What is diabetes?

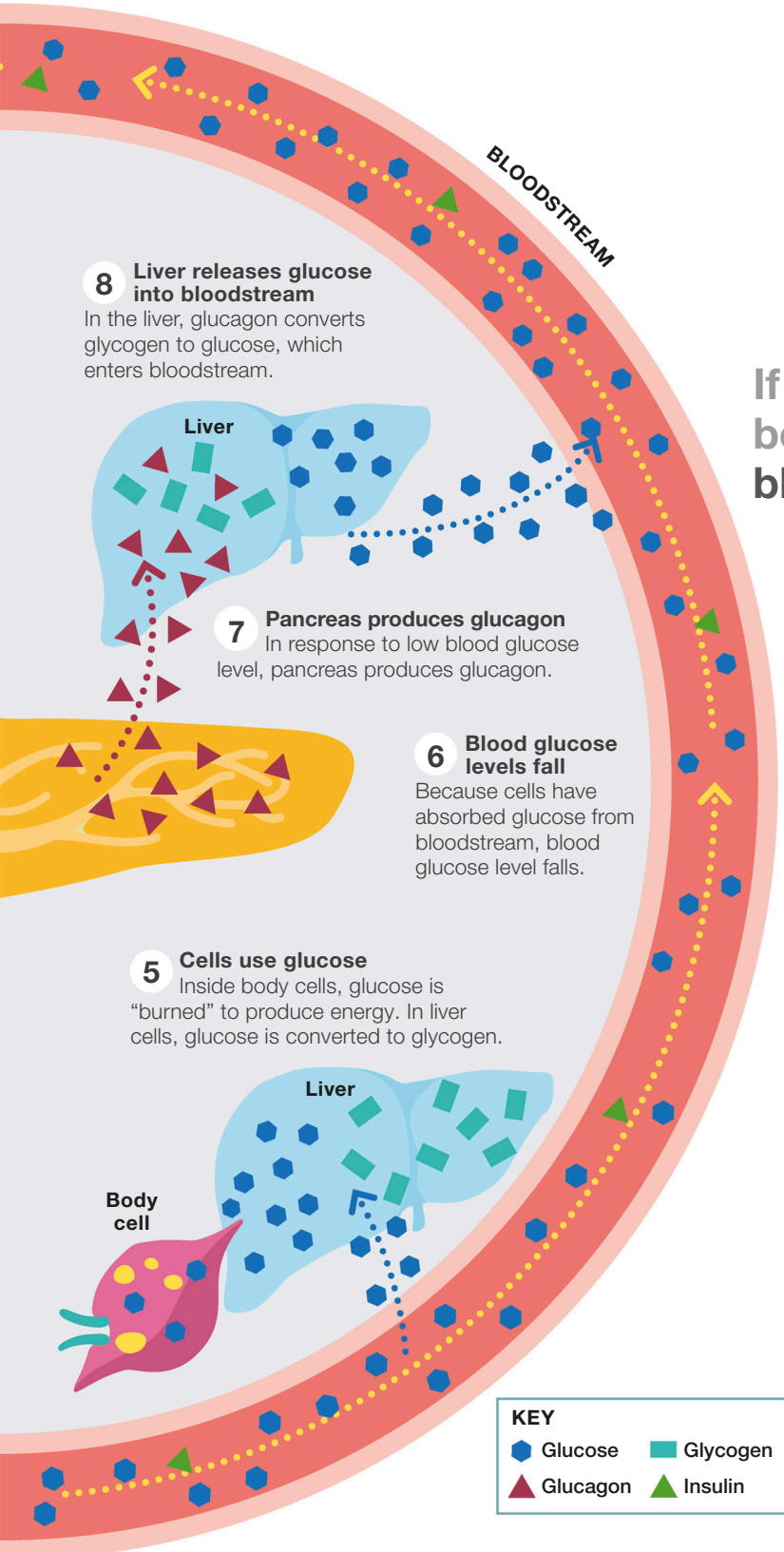
In diabetes, glucose in the blood cannot get into your body cells and they are deprived of their usual source of energy. Your body tries to remove excess glucose in the blood by excreting it in urine, and it uses fat and protein (from muscle) as alternative energy sources. This disrupts your body processes and leads to the symptoms of diabetes (see pp.18–19).

How the body usually uses glucose

When you eat carbohydrates, they are broken down into glucose, which passes from the digestive tract into the bloodstream and from there into body cells, where it is used to provide energy. Some glucose is also stored in the liver and muscles in the form of glycogen.The level of glucose in the blood is controlled by two main hormones: insulin and glucagon. These work together to keep your blood glucose level within a narrow range. Both hormones are produced in the pancreas, by clusters of cells called the islets of Langerhans. There is a constant background level of insulin but when your blood glucose rises, extra



▷ **The body's response to glucose**
In a person who does not have diabetes, the level of glucose in the blood is kept within narrow limits by a feedback mechanism controlled by the pancreatic hormones insulin and glucagon.



insulin is released. Insulin acts like a key, unlocking body cells so that glucose can enter. When your blood glucose falls, your pancreas releases more glucagon, which converts glycogen in your liver back to glucose. This enters your bloodstream and blood glucose rises again.

If you have diabetes, your body cannot control your blood glucose effectively

What is different in diabetes

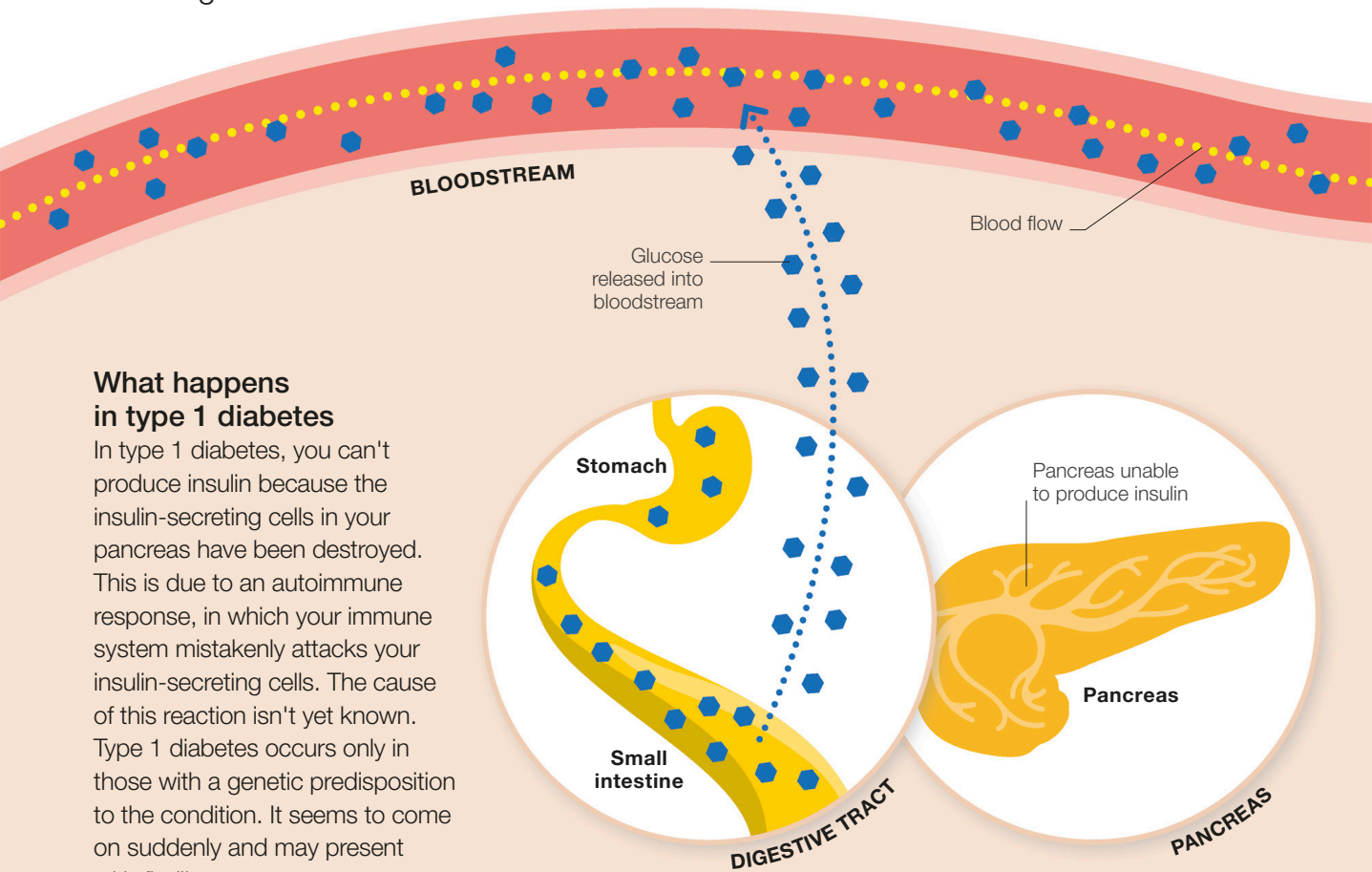
When you have diabetes, you do not produce any insulin, produce too little of it, or your body cells are resistant to its effects. As a result, glucose builds up in the blood and causes symptoms such as passing large amounts of urine, due to your body removing the excess glucose by filtering it out into the urine. Because your body cannot use glucose for energy, it uses its muscle and fat stores instead, which can cause symptoms such as weight loss. A blood glucose level that is only slightly raised—a condition known as prediabetes—may not produce symptoms and may be detected only by a blood test (see pp.20–21). A blood glucose level that is significantly above the usual range indicates diabetes.

Types of diabetes

Although diabetes is often referred to as if it were a single condition, there are actually different types. The main ones are type 1 (see pp.12–13) and type 2 (see pp.14–15) but there are also other types (see pp.16–17), such as gestational diabetes and maturity onset diabetes of the young, or MODY.

Type 1 diabetes

In this type of diabetes, your pancreas does not produce insulin. As a result, your body cells cannot absorb glucose, your blood glucose level rises unchecked, and your cells are deprived of their primary energy source, leading to symptoms such as increased thirst, fatigue, passing large amounts of urine, and weight loss.



What happens in type 1 diabetes

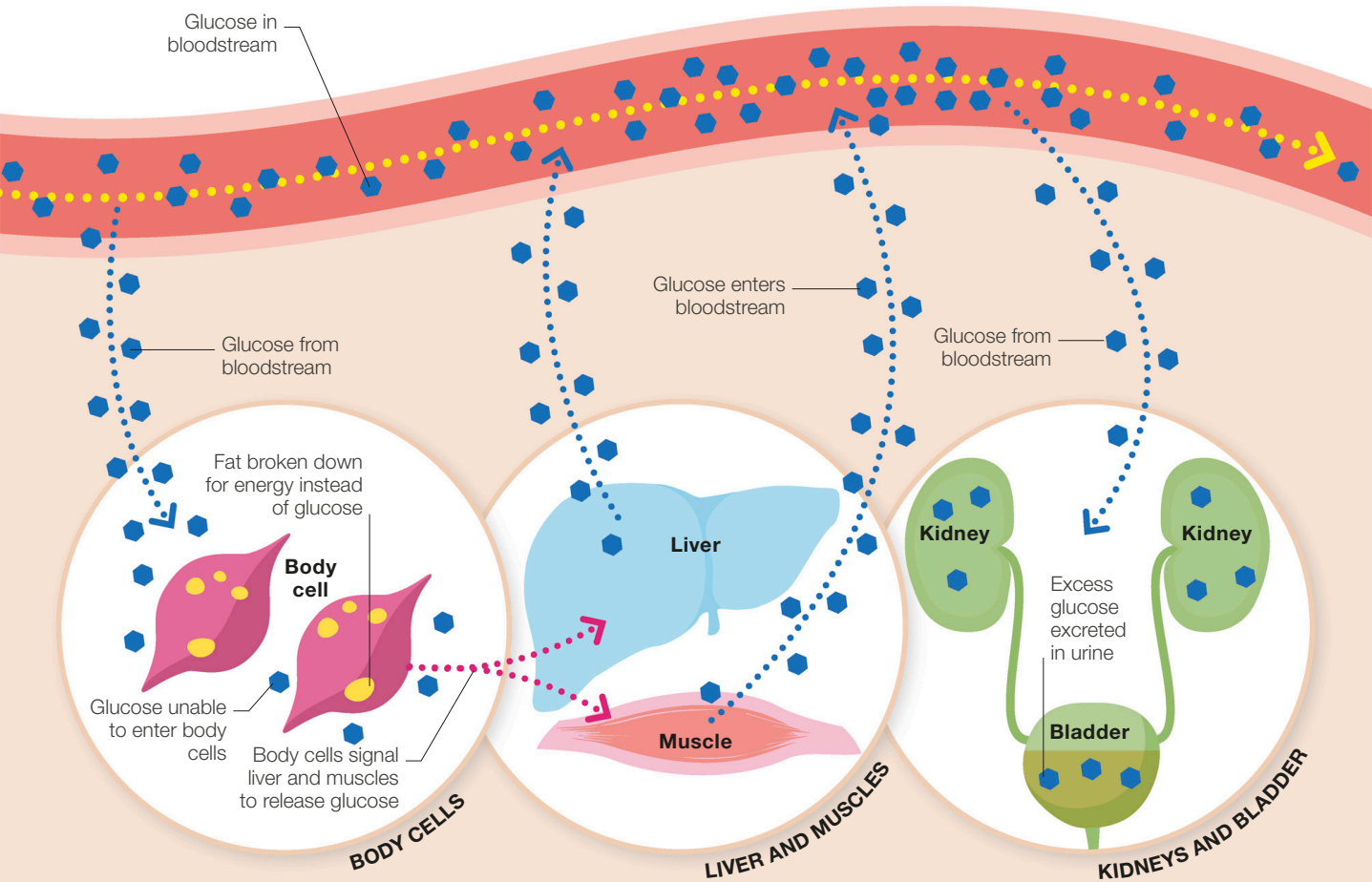
In type 1 diabetes, you can't produce insulin because the insulin-secreting cells in your pancreas have been destroyed. This is due to an autoimmune response, in which your immune system mistakenly attacks your insulin-secreting cells. The cause of this reaction isn't yet known. Type 1 diabetes occurs only in those with a genetic predisposition to the condition. It seems to come on suddenly and may present with flu-like symptoms, nausea, and vomiting.

1 Glucose enters blood
During digestion, glucose is released from the digestive tract into the blood. Normally, this triggers mechanisms to absorb the glucose—including the release of insulin by the pancreas—which lower the blood glucose level.

2 No insulin available
In type 1 diabetes, the insulin-producing cells of the pancreas have been destroyed, so no insulin is released. Insulin "unlocks" body cells, allowing them to absorb glucose from the blood. Without insulin, the blood glucose level remains high.

FEATURES OF TYPE 1 DIABETES

- Can develop at any age, although it is less common for the condition to develop after the age of 40
- Needs lifelong treatment with insulin
- Body doesn't produce its own insulin
- It is an autoimmune condition, independent of body weight
- Symptoms usually come on quickly
- Research is ongoing to prevent or find a cure



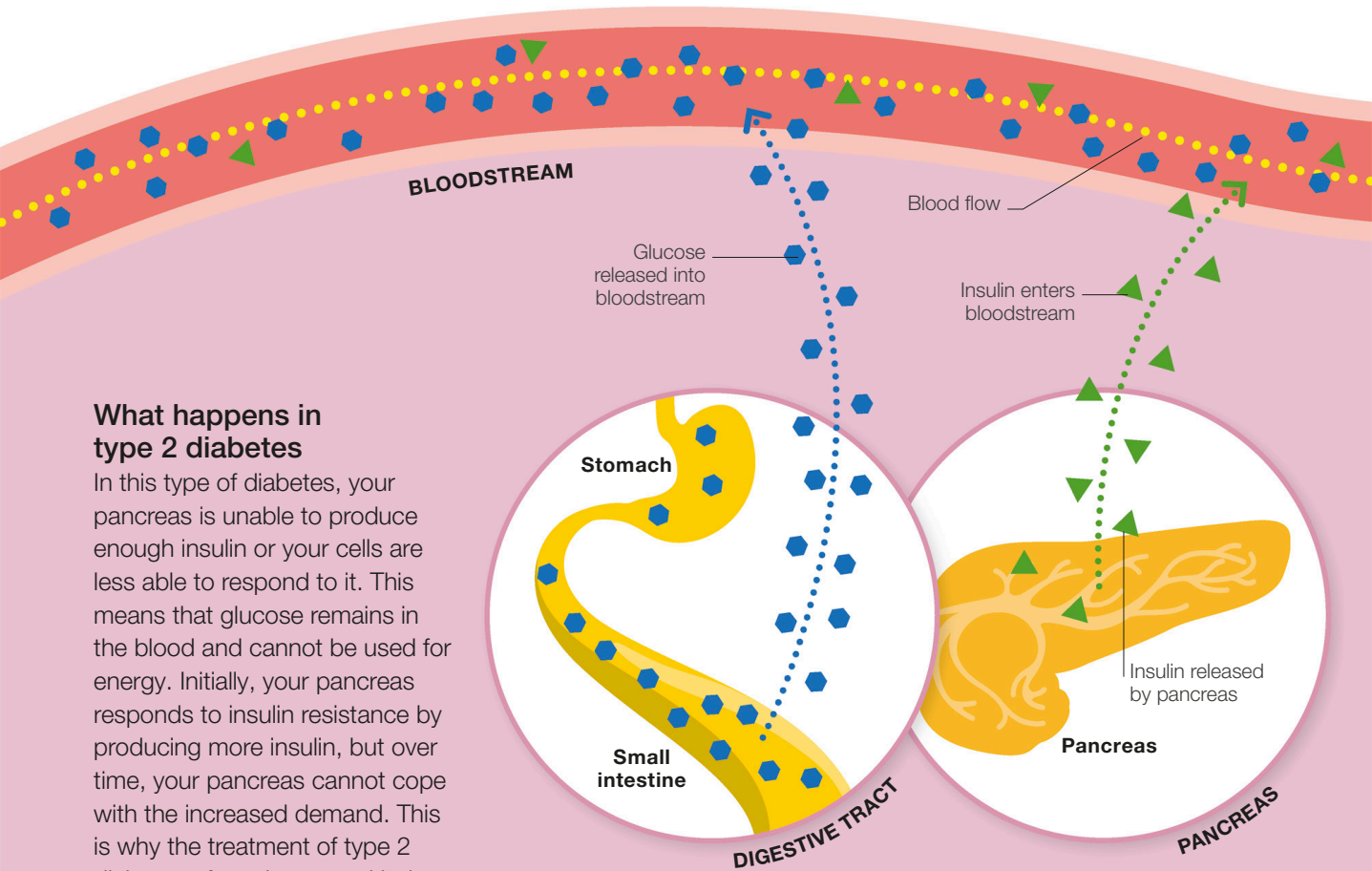
3 Cells starved of glucose
Because the body cells cannot absorb glucose from the blood, they are deprived of their primary source of energy. However, they still need energy to function, so they break down fat as an alternative energy source.

4 Blood glucose continues to rise
Starved of glucose, body cells signal the liver and muscles to release more glucose into the blood. However, without insulin, this extra glucose cannot enter the cells and so the blood glucose level rises further.

5 Kidneys produce more urine
To remove excess glucose from the blood and attempt to reduce the blood glucose level to normal, the kidneys filter out the excess glucose, producing large amounts of glucose-containing urine.

Type 2 diabetes

In type 2 diabetes—the most common form of the condition—your pancreas produces some insulin, but either in insufficient amounts and/or your body cells are resistant to its action. As a result, your cells receive too little glucose and your blood glucose level rises too high.



What happens in type 2 diabetes

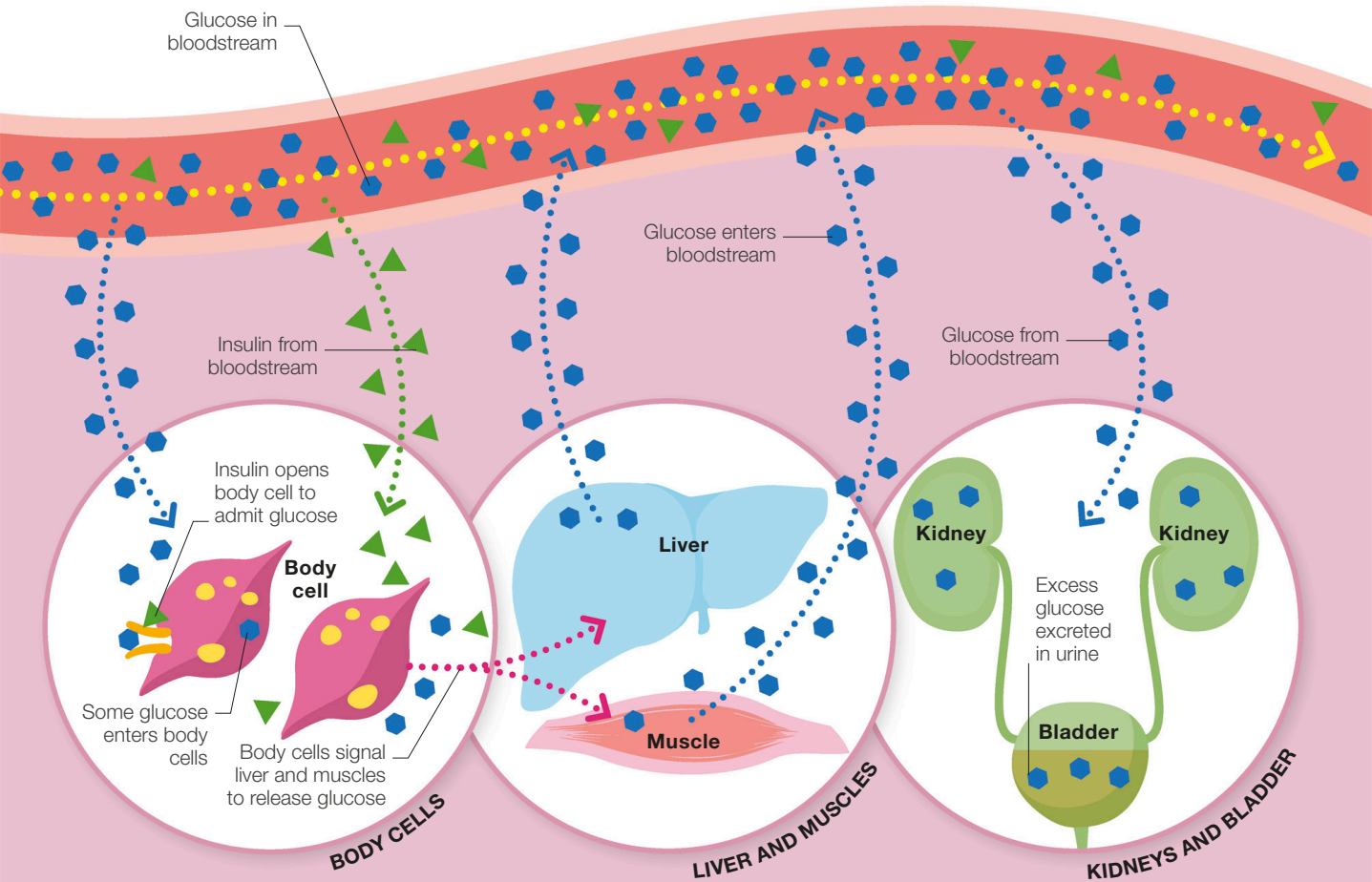
In this type of diabetes, your pancreas is unable to produce enough insulin or your cells are less able to respond to it. This means that glucose remains in the blood and cannot be used for energy. Initially, your pancreas responds to insulin resistance by producing more insulin, but over time, your pancreas cannot cope with the increased demand. This is why the treatment of type 2 diabetes often changes with time and eventually you may need insulin. Type 2 diabetes is often, although not always, associated with being overweight.

1 Glucose enters blood
During digestion of food in the digestive tract, glucose is produced by the breakdown of carbohydrates. This glucose then passes through the wall of the intestine into the bloodstream, which circulates it to all parts of the body.

2 Insulin produced
On detecting glucose in the blood, the pancreas releases extra insulin. This hormone is essential to enable body cells to take in glucose, but in type 2 diabetes, the pancreas produces too little insulin or the body cells are resistant to it.

FEATURES OF TYPE 2 DIABETES

- Usually starts in later adulthood, but is becoming more common in teenagers and young adults
- Body produces insulin but either too little and/or the body cells are resistant to its action
- Symptoms may come on gradually or may not be obvious
- Managed with healthy eating, physical activity, medication, and sometimes insulin. Treatment may change over time
- Often affects people who are overweight
- If overweight, losing weight generally improves blood glucose levels



3 Cells starved of glucose
Due to the lack of insulin or the inability of the body cells to utilize it fully, the cells can take in only a small amount of glucose. As a result, they cannot obtain as much glucose as they need for their energy requirements.

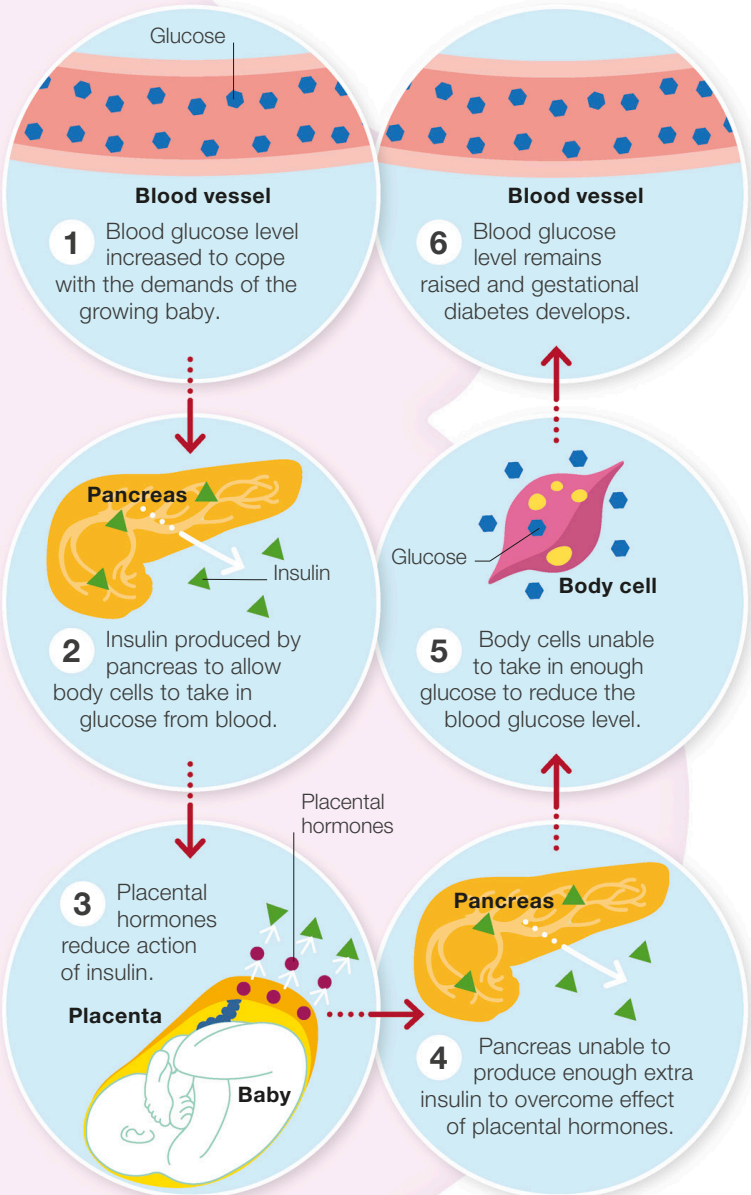
4 Glucose rises further
To try to get more glucose, the body cells signal the liver and muscles to release glucose into the blood. However, most of this glucose cannot enter the cells and remains in the blood, causing the blood glucose level to increase even further.

5 Kidneys produce more urine
In order to try to bring the blood glucose back to normal, the kidneys filter out the excess glucose from the blood, producing large amounts of glucose-containing urine as a result.

What happens in gestational diabetes
Diabetes that develops during pregnancy is mainly due to placental hormones reducing the effectiveness of insulin, combined with the pancreas not being able to produce enough extra insulin to compensate. As a result, body cells cannot take in enough glucose to reduce the raised blood glucose level.

Other types of diabetes

In addition to type 1 and type 2 diabetes, there are other types. Diabetes may also occur as a result of another medical condition or treatment; this is known as secondary diabetes.



Gestational diabetes

Diabetes that first appears during pregnancy is known as gestational diabetes. This type of diabetes increases the risk of developing type 2 diabetes. Usually gestational diabetes is temporary, appearing at around 24–28 weeks of pregnancy and disappearing when the baby is born. Women who develop this type of diabetes have appoximately a 50% chance of developing type 2 diabetes in the future. When you are pregnant, your body increases its blood glucose to cope with the demands of a growing baby and more insulin is needed. However, the hormones produced by your placenta make insulin less effective. If your insulin production isn't able to overcome this reduced effectiveness, glucose remains in the blood and gestational diabetes develops. This condition may not cause symptoms, but it will be detected during routine prenatal checkups. If you do develop gestational diabetes, you will be offered personalized treatment and care during your pregnancy (see pp.136–137).

Maturity onset diabetes of the young

Commonly known as MODY, this is a rare type of genetic diabetes that occurs in people under the age of 25 who have a family history of diabetes in at least two generations. MODY is often

inadvertently diagnosed as type 1 or type 2 diabetes. In addition, MODY is often treated with insulin when in many people it could be managed sucessfully with other diabetes medications or, in some people, without any medication.

Latent autoimmune diabetes in adults

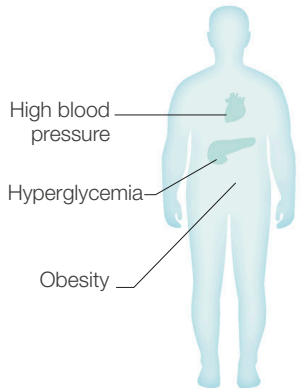
This condition (often called LADA) has features of both type 1 and type 2 diabetes and so is sometimes referred to as "type one-and-a-half diabetes." LADA typically develops later in life than type 1. Like type 1, it occurs because your pancreas stops producing insulin, thought to be due to the immune system attacking your insulin-producing cells. However, unlike type 1, your insulin-producing cells continue to produce some insulin for months or even years. The symptoms of LADA are typical of diabetes and tend to come gradually: persistent tiredness; excessive urination; continual thirst; and weight loss. If you diagnosed with LADA, treatment will usually be with insulin, depending on your blood glucose levels.

Neonatal diabetes

This type of diabetes is rare and is defined as diabetes diagnosed before the age of 6 months. It is caused by a genetic mutation that affects insulin production. There are two types of the condition: temporary and permanent. In the temporary type, the condition typically disappears by the age of about 12 months. The permanent type is lifelong and can be confirmed by genetic testing. Treatment may be with pills or insulin.

METABOLIC SYNDROME

This condition is not strictly a type of diabetes but is an umbrella term for the combination of high blood pressure, obesity, and hyperglycemia. Each condition by itself increases the risk of developing serious health problems, such as cardiovascular disease, so taking steps to address them is well worth the effort.



About 1 woman in 20 who becomes pregnant develops gestational diabetes

Secondary diabetes

Diabetes that results from another health problem or medical treatment is known as secondary diabetes. There are various possible causes, including viral infections that destroy insulin-producing cells in the pancreas; damage to the pancreas from conditions such as cystic fibrosis or pancreatitis; removal of the pancreas; certain hormonal disorders, for example, Cushing's disease; or as a side effect of some medications, such as corticosteroids. The treatment varies according to the underlying cause.

Prediabetes

The term "prediabetes" refers to blood glucose that is slightly raised but not high enough to be classified as diabetes. If you are diagnosed with prediabetes, you can reduce your risk of developing type 2 diabetes with eating and activity changes, and support from your health professional (see pp.22–23).

Symptoms

The symptoms of type 1 and type 2 diabetes are similar, but they tend to come on suddenly in type 1 and develop gradually in type 2. To see whether your symptoms mean you have diabetes, it's important to have them checked by a doctor for a definite diagnosis (see pp.20-21).

GET EMERGENCY MEDICAL HELP

If you or anyone else has intense thirst and any of the following:

- Nausea and vomiting; stomach pain; fruity-smelling breath; confusion; feeling faint or fainting; recent dramatic weight loss.

Recognizing diabetes

It is more common to be aware of the symptoms of high blood glucose if you have type 1 diabetes, because the absence of insulin has a dramatic effect on the body. If you have type 2 diabetes, you still produce some insulin, so your symptoms may be less severe—you may even attribute them to other causes, such as emotional stress or growing older. Some people who have type 2 diabetes do not have any noticeable symptoms and may not suspect that they have diabetes until it is detected in a routine medical or eye test or a medical test for another health problem. Type 2 diabetes is also becoming more common in children and young people, so checking any symptoms with a health professional is important at any age.

You may feel tired all the time, lose weight, be constantly thirsty, and frequently pass large amounts of urine

▷ **Constant thirst**
A common symptom of diabetes is feeling thirsty all the time, due to your kidneys producing large amounts of watery urine to filter out the excess glucose from your blood.

▽ **Possible symptoms of diabetes**

Diabetes can cause a wide range of symptoms, because it disrupts a vital aspect of body chemistry that affects all body cells. The main symptoms are similar in the most common types of diabetes—type 1 and type 2. The main difference between the two is that symptoms tend to come on suddenly in type 1 but more gradually in type 2.

TIREDNESS AND LACK OF ENERGY

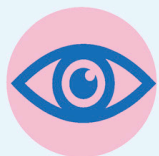
Because your cells are deprived of glucose—their main energy source—you may feel tired and lacking in energy all the time, even if you rest or sleep more than usual. You may also sometimes feel dizzy.

THIRST AND DRY MOUTH

Because you are passing a large amount of urine as part of your body's mechanism for reducing the level of glucose in your blood, you become dehydrated, which causes thirst and a dry mouth.

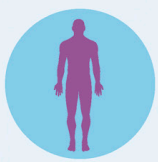
BLURRED VISION

When your blood glucose is raised, the lenses of your eyes absorb glucose and water. This makes them swell, causing blurred vision.



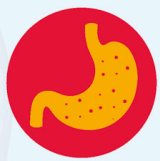
WEIGHT LOSS

When your body cannot use glucose, it starts to break down its fat and muscle stores for energy instead, so you may lose weight and muscle bulk. Weight loss is more common and rapid in type 1 diabetes. In type 2, weight loss may happen slowly or not at all.



PERSISTENT HUNGER

You may feel hungry much of the time, even shortly after eating, because the glucose from the digestion of food cannot enter your body cells due to the lack of insulin.



SLOW HEALING

Persistent raised blood glucose may lead to poor circulation of blood throughout the body. Because blood is needed to repair tissues, an impaired blood supply can slow down healing of damaged tissue, such as skin wounds.

FREQUENT, COPIOUS URINATION

When your blood glucose is too high, your kidneys filter out the excess glucose from your blood. To expel this excess glucose, your kidneys produce more urine.

SEXUAL DYSFUNCTION

Long-term raised blood glucose may lead to nerve damage and/or poor blood circulation. These, in turn, may cause problems such as erectile dysfunction in men or, in women, reduced sexual desire or painful intercourse.

CYSTITIS AND THRUSH

The glucose in your urine encourages bacteria and other microorganisms to grow in your urinary tract. This, in turn, may lead to infections such as cystitis (bladder infection) and thrush (infection of the vagina in women or penis in men), causing symptoms such as irritation around the penis or vagina.

Diagnosis

If you have symptoms that suggest you may have diabetes (see pp.18–19), you should consult your doctor because a definite diagnosis requires lab tests to measure the level of glucose in your blood.

Types of tests

Your doctor (or other health professional) will check your glucose levels with one or more laboratory blood tests using a blood sample taken from a vein in your arm. Diabetes is diagnosed by a random blood glucose test, a fasting blood glucose test, or by an oral glucose tolerance test. You may also be given a test called a glycosylated hemoglobin test (hemoglobin A1c test, see p.31). This test provides a single measurement of your blood glucose that indicates what your average blood glucose level has been over the previous 2–3 months.

DIAGNOSING DIABETES (NON-GESTATIONAL)

FASTING BLOOD GLUCOSE	A1C
Diabetes (above 126 mg/dl)	A1c 6.5% or higher
Prediabetes (100–125 mg/dl)	A1c 5.7–6.4%
Normal range (70–100 mg/dl)	A1c less than 5.7%

Blood glucose levels

The blood tests that are used to diagnose diabetes provide a measurement of the concentration of glucose in your blood—the amount of glucose in a specific volume of blood. The result—the blood glucose level—is given as milligrams of glucose per deciliter of blood; this is abbreviated as mg/dl. The blood tests also enable prediabetes to be identified. In this condition, your blood glucose is slightly raised (100–125 mg/dl, as measured by a fasting blood glucose test) but is not high enough for diabetes to be diagnosed. However, a diagnosis of prediabetes indicates that you are at increased risk of developing type 2 diabetes, enabling you to take measures to reduce your risk (see pp.22–23).

◁ **Fasting blood glucose levels**
Your blood glucose level after fasting can indicate whether you do not have diabetes, or if you have prediabetes or diabetes.

MEDICAL TESTS USED IN THE DIAGNOSIS OF DIABETES

Although a urine or fingerstick test can reveal a raised blood glucose level, you need one or more of three laboratory blood tests to diagnose diabetes: the random or fasting blood glucose test and, if necessary, the oral glucose tolerance test. Your results are assessed with your symptoms. If you don't have any symptoms but your results are slightly elevated, you will need a repeat blood test carried out on a different day.

	HOW THE TEST IS CARRIED OUT	WHAT THE RESULTS MEAN
 **A1c test**	Your health professional will either arrange for you to go to the lab to have your blood drawn and analyzed, or perform a fingerstick and use a machine to analyze your blood in the clinic. This can be done regardless of whether or not you have eaten.	Whether or not you have symptoms, an A1c result of 6.5% or higher indicates diabetes. A fasting blood glucose test may also be done to confirm the diagnosis.
 **Random blood glucose test**	Your health professional will arrange for you to go to a lab to have your blood drawn; your blood will then be analyzed by the lab. This test can be done regardless of whether or not you have eaten.	If you have symptoms and your blood glucose result is above 200 mg/dl, you are diagnosed with diabetes. If you have no symptoms, or the result is lower than this, you may have a repeat test while fasting or be given an oral glucose tolerance test.
 **Fasting blood glucose test**	You do not eat or drink overnight, and in the morning you will to go to a lab to have your blood drawn; your blood will then be analyzed by the lab.	If you have symptoms and your blood glucose result is above 126 mg/dl, you are diagnosed with diabetes. If you have no symptoms, or the result is lower and you have symptoms, you may have a repeat test or be given an oral glucose tolerance test.
 **Oral glucose tolerance test**	You do not eat or drink overnight and in the morning you go to a lab to have a blood sample taken from your arm. Afterward you are given a glucose drink, and 2 hours later another blood sample is taken from your arm. The samples are sent for analysis.	If your fasting blood glucose level is 126 dg/mll or higher and/or your 2-hour test result is above 200 mg/dl, you are diagnosed with diabetes, whether or not you have symptoms. This test is used when other tests have been inconclusive or if you have risk factors for diabetes.

An A1c test measures the amount of glucose attached to the hemoglobin in your blood

Preventing and reversing diabetes

For many people with type 2 diabetes, managing their diabetes is possible through weight loss and increased activity. These measures may also often help to prevent prediabetes from progressing to type 2 diabetes. Other types of diabetes cannot yet be prevented or reversed, although careful diabetes management can help to minimize their effects.

Prediabetes and type 2 diabetes

In prediabetes, your blood glucose is raised above normal limits but not high enough to be defined as diabetes. It is an indication that you are at high risk of developing type 2 diabetes.

If you have prediabetes, it is possible to prevent or delay the onset of type 2 diabetes by losing weight, if you weigh more than the recommended healthy weight for your height (see pp.92–93), and becoming more active. The same measures may also help to reverse type 2 diabetes in the early years after diagnosis or, at any time, reduce or delay the need for medication. If you do not have prediabetes or type 2 diabetes but are concerned that you may develop them, you can reduce your risk by maintaining a healthy weight, following healthy eating principles, and being physically active on a regular basis.

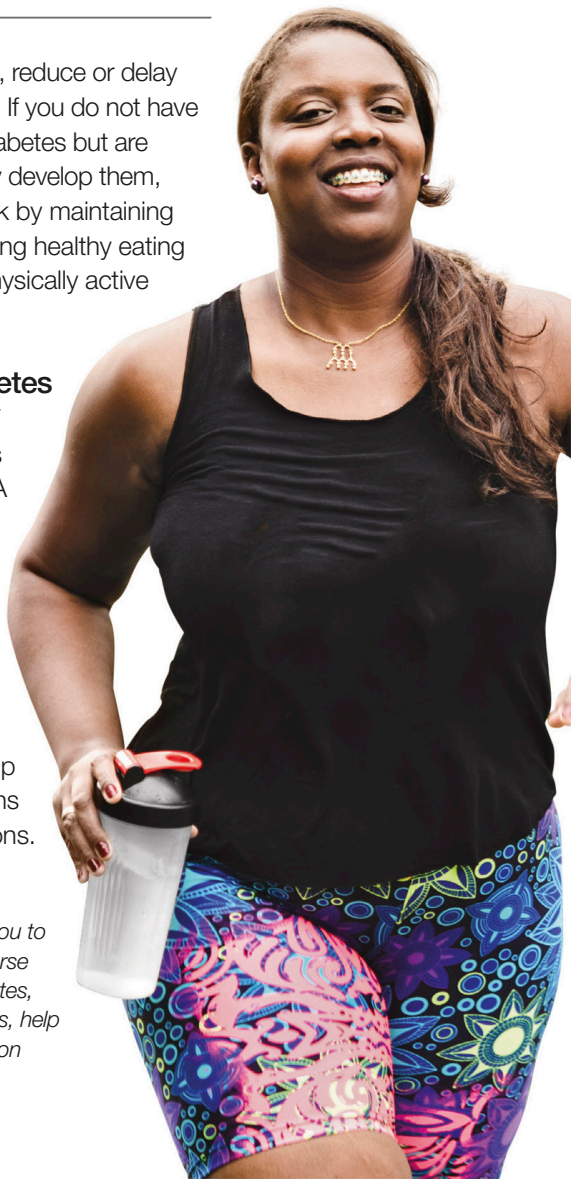
CHILDREN AND YOUNG PEOPLE

Type 1 diabetes Research is being conducted to delay the onset of type 1 diabetes in younger groups at risk of developing it, but the research is still developing and evolving.

Type 2 diabetes Methods for preventing this type of diabetes or minimizing its effects for children and young people are the same as those for adults: weight loss and increased activity. Specialized help from health professionals is vital, together with emotional and practical support for the whole family.

Other types of diabetes

Type 1 diabetes, MODY (maturity onset diabetes of the young), and LADA (latent autoimmune diabetes in adults) cannot yet be cured, prevented, or reversed. However, maintaining a healthy weight, eating healthily, and being physically active can help to manage the conditions and prevent complications.



▷ **Benefits of exercise**
Regular exercise can help you to lose weight, prevent or reverse prediabetes or type 2 diabetes, and, for any type of diabetes, help you to manage your condition more successfully.

If you develop gestational diabetes, it may disappear after you have given birth, although it indicates that you are at high risk of developing type 2 diabetes. You can help to minimize this risk by maintaining a healthy weight and eating pattern.

Practical measures

For information on measures to lose weight (if necessary), see pp.94–99, and for suggestions about becoming more active, see pp.100–103. Together, weight loss and increased physical activity reduce the amount of internal fat around your liver and pancreas, which increases the efficiency of insulin production. Reducing internal fat also counteracts insulin resistance by increasing your body cells' response to insulin. In addition, these measures help to reduce health risks associated with diabetes, such as heart disease, and physical actvity can help to reduce stress and boost your mood.

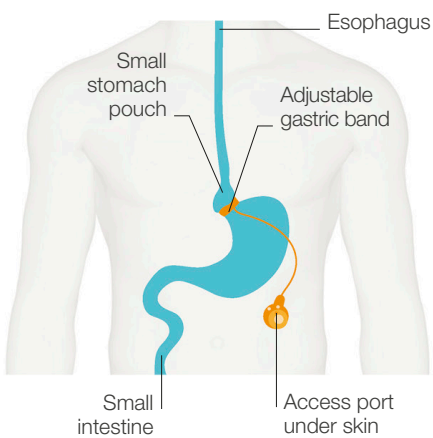
Preventing or reversing type 2 diabetes means that you have reduced your blood glucose level into the non-diabetes range. However, this does not mean that you have been cured. There is the risk that your prediabetes or type 2 diabetes will return—for example, if you regain lost weight. Checkups are important for ongoing monitoring of your health.

Losing weight and becoming more active can be very challenging. You will be more successful if you have clear, realistic goals, an action plan, and encouragement. Ask your health professional for personalized support to help you achieve your goals. If you have prediabetes or type 2 diabetes, you may also be offered a program to help you prevent or reverse your diabetes.

The keys to prevention or reversal are losing weight and becoming more active

Weight-loss surgery

Also called bariatric surgery, weight-loss surgery is not usually recommended for diabetes unless you have type 2 diabetes, are very overweight, and have been unable to lose weight by any other means. There are various procedures, but they all either reduce the size of your stomach or reroute part of your digestive tract to bypass the stomach and/or part of the intestine. The least invasive procedure is gastric banding, which is reversible, unlike other types of bariatric surgery. Surgery can be effective in reversing type 2 diabetes, reducing blood pressure and blood lipid levels (such as blood cholesterol levels), and improving your health and quality of life in the long term. However, weight-loss surgery is not suitable for everybody and, like all surgery, carries the risk of complications and adverse effects.



◁ **Gastric banding**
In this type of bariatric surgery, the size of the stomach is reduced by placing an inflatable band around the upper part of the stomach. The band can be tightened by injecting liquid into it through an access port implanted just under the skin.

What to expect when first diagnosed

A diagnosis of diabetes can affect your life in many ways. It may affect you emotionally and will also have practical effects on your everyday life as you learn to manage your condition. You will have various medical checks, meet a range of health professionals, and receive a great deal of advice and information about adjusting to life with diabetes.

Medical checks and treatment

If initial checks or symptoms indicate that you may have diabetes, the diagnosis will need to be confirmed using special tests (see pp.20–21) by a doctor. If the diagnosis is confirmed, you will have additional medical checks to assess other aspects of your health, such as your eye health, heart and circulation, and nerve function. These checks also provide a baseline for your future annual reviews, which will include the same checks (see pp.142–143). The initial checks are also useful for detecting any health issues that need immediate treatment or monitoring.

Along with the medical checks, you will be prescribed initial treatment for your diabetes—you may need either insulin or other medication. If you have type 1 diabetes, you may be referred to a specialist who will teach you how to manage insulin; for the first few weeks, you will also have frequent—possibly daily—contact with the clinic staff. If you have type 2 diabetes, you may continue to see your PCP or be referred to a specialist to determine if diabetes medication should be prescribed. If necessary, you may also be prescribed other medication, for example, to reduce high blood pressure.

Your initial care may also include a consultation with a dietitian about your food in relation to your diabetes, or with a diabetes care and education specialist to provide any immediate practical advice you may need, such as help with blood glucose monitoring.

INITIAL MEDICAL VISIT

Height and weight measurement to calculate your body mass index (see p.93).

Blood pressure measurement and checking your heart health with a stethoscope

Examination of your legs and feet to check your blood circulation and sensation

Dilated eye exam with an eye doctor to check the health of your retina (the light-sensitive layer in your eyes)

Blood tests to check your glucose levels (with the A1c test, see p.31); blood lipids, such as cholesterol; thyroid function; liver function; and kidney function

Coming to terms with living with diabetes means exploring your feelings as much as taking insulin or other medication

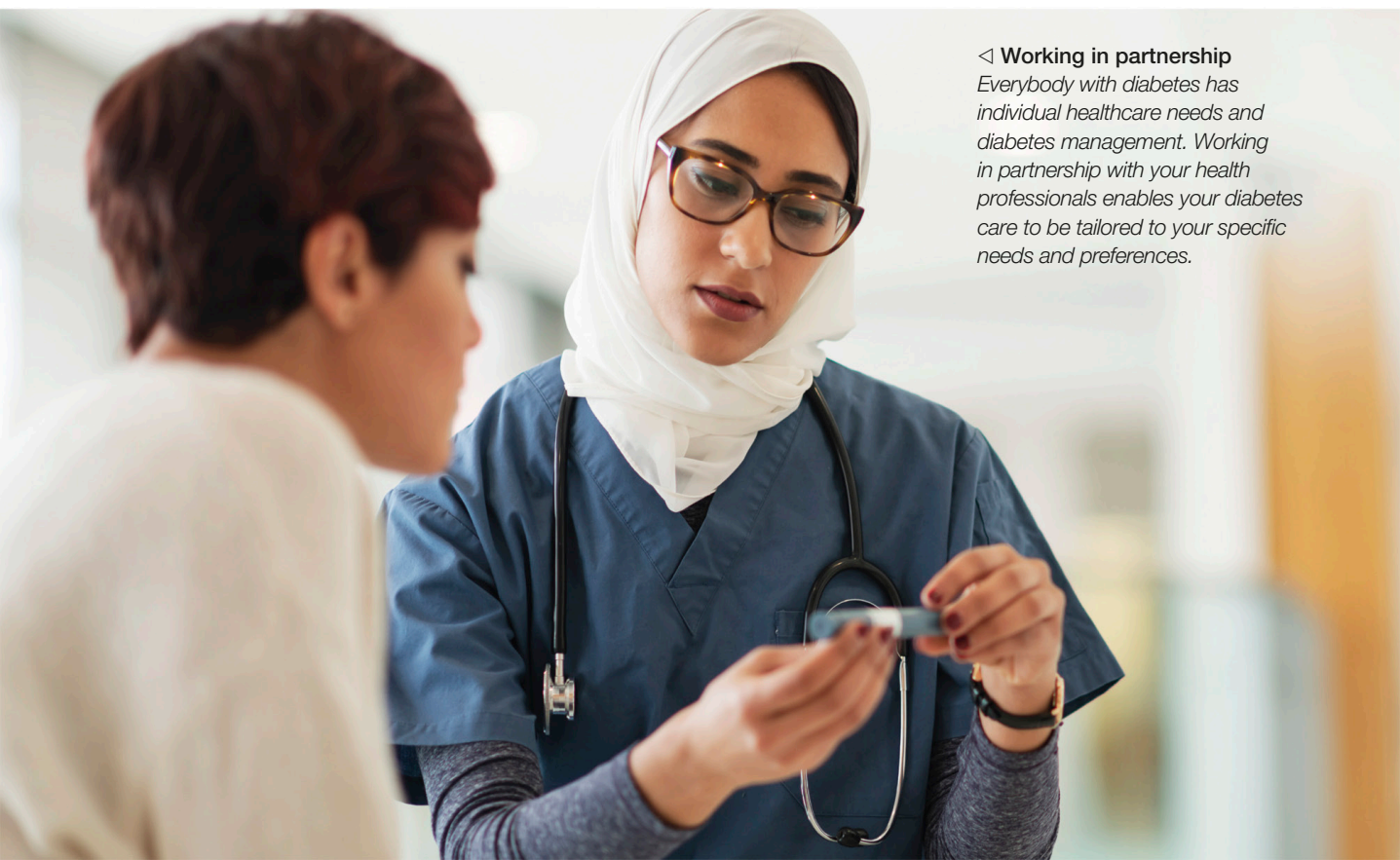
Working with health professionals

Diabetes care is optimal when you and your health professionals work together as a team, with you as the expert on your own life and health and them as experts on the medical aspects of the condition. This approach is known as individualized care planning, and it begins right from diagnosis.

When you are first diagnosed, you may be referred to a diabetes care and education specialist to whom you can ask questions to learn more about the condition. You may also take a course, run by diabetes health professionals, where you can meet others who are also newly diagnosed, or have an individual session for diabetes education. The timing and length of the courses vary, but the content is similar and includes information about diabetes itself, food, treatments, and how to keep healthy. Carbohydrate counting, adjusting insulin doses, and dealing with hypoglycemia are also covered. Some people are worried about attending a course or find it inconvenient to attend. If you have any concerns, you can request a referral for a one-on-one visit.

Emotional support

When you are first diagnosed with diabetes, it can take time to adjust emotionally. You will be asked about your feelings during your early consultations and be given the chance to talk about them. This is important because your feelings can influence how well you are able to manage your diabetes so that you stay healthy (see pp.110–111). You may also find it helpful to join a diabetes support group, whether you have diabetes yourself or are responsible for someone who has diabetes. When you are first diagnosed, trying out a local or online support group—peer support—will help you figure out whether the group is useful for you. Your health professional can also give you information about support groups.



◁ **Working in partnership**
Everybody with diabetes has individual healthcare needs and diabetes management. Working in partnership with your health professionals enables your diabetes care to be tailored to your specific needs and preferences.

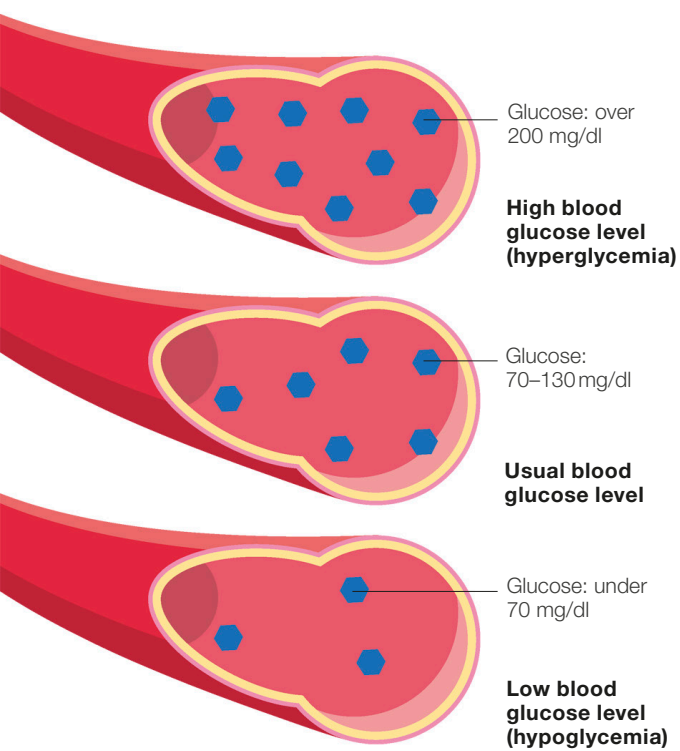
Managing your blood glucose

Monitoring blood glucose

Regularly monitoring the amount of glucose in your blood is a key part of the daily care of your diabetes. The results give you information about how your blood glucose is responding to treatment, so you can adjust it if necessary. To manage your blood glucose effectively, it can help if you understand what level you are aiming for and the factors that can affect it.

Understanding blood glucose levels

Your blood glucose level is a figure that indicates the concentration of glucose in your blood. The level is given as milligrams per deciliter of blood (abbreviated to mg/dl). The blood glucose level naturally changes throughout the day. For people without diabetes, their body keeps the level within a constant range, usually 70–130 mg/dl. For people with diabetes, their body cannot maintain the glucose level effectively and the changes tend to be larger and more frequent.



Types and aims of monitoring

There are three main types of monitoring: self-checks of your blood glucose level, which you do every day, measuring your A1c (glycosylated hemoglobin) level, which is done by your healthcare professional at regular intervals, and continuous glucose monitoring.

The aim of self-checks is to give you information about the effects of the factors that can affect your blood glucose level, such as food, beverages, activity, and medication. If you change your diabetes treatment, monitoring your blood glucose will give you vital feedback on how well the treatment is working. Self-checks can also tell you if your blood glucose is low (hypoglycemia, see pp.62–67) or raised (hyperglycemia, see pp.68–71), and can help you to manage special situations, such as illness. The A1c test gives a measure of your blood glucose level over the previous two or three months.

If you change your diabetes treatment, monitoring your blood glucose will give you vital feedback on how well the treatment is working

▷ **Blood glucose checking**

Using a lancet to obtain a drop of blood from your finger for checking your blood glucose level with a meter is simple to do and can usually be fitted into your everyday activities. This fingerstick method provides a snapshot of your blood glucose level at that time.

Recommended blood glucose levels

Whatever type of diabetes you have, as a general rule of thumb, it is recommended that you aim to keep your blood glucose within the 80–130 mg/dl range. This is close to the blood glucose range of a person without diabetes. A blood glucose level that is in the recommended range will keep you feeling well and help to prevent possible long-term complications. Although a blood glucose level of 80–130 mg/dl is a general recommendation, you and your healthcare professional may agree on different target ranges that are appropriate for you personally. In addition, you may be given different recommended targets in specific circumstances; for example, if you have difficulty recognizing when you have low blood glucose or if you are trying to conceive.

Frequency of checks

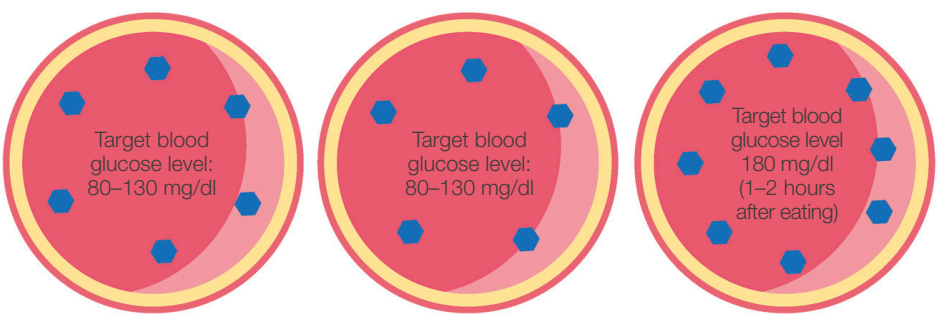
If you have type 1 diabetes, you will be advised to check your blood glucose between 4 and 10 times a day. If you have type 2 diabetes, you may not need to check your blood glucose levels as often. Some drugs, such as sulphonylureas (see pp.58–59) or insulin (see pp.42–43), may increase the risk of hypoglycemia. If you take these medications you may need to check your blood glucose more often.

Whatever type of diabetes you have, if you are particularly concerned about low blood glucose while you are sleeping, you may be advised to check your blood glucose level during the night. There are other times and situations in which your blood glucose level is likely to vary or you are at particular risk of low blood glucose and you will need to do extra checks (see box, above). If you

KEY TIMES FOR EXTRA MONITORING

Monitoring your blood glucose is always important, but there are certain times when you need to check more often.

- During and for several hours after vigorous or long periods of exercise.
- If you have an unpredictable work pattern or do shift work.
- If you change your medication and/or insulin regimen.
- When planning a pregnancy and during the pregnancy itself.
- When you are ill.
- If you have been drinking alcohol or using recreational drugs.
- During holidays and celebrations.



◁ **Typical recommended targets**
Blood glucose targets vary according to other medical conditions and your risk of low blood glucose. The figures given here are examples of typical targets for adults with type 1 or type 2 diabetes, but your personal targets may be different.

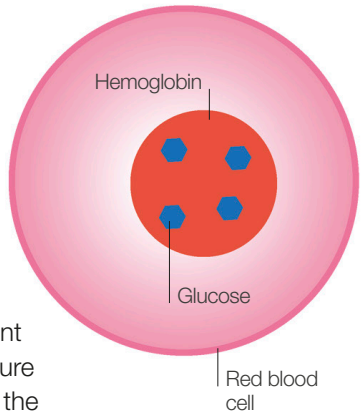
normally check your blood glucose level, you will also need to make sure you check it before you drive and at frequent intervals while you are driving (see pp.114–115).

Self-monitoring

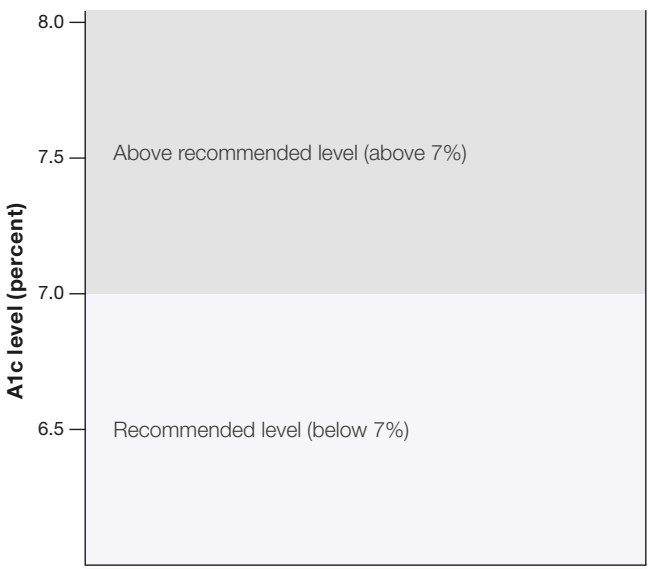
There are various methods of checking your own blood glucose levels. The most common method for monitoring your glucose levels is self-checking using a blood glucose meter. This is done with the fingerstick method, in which a drop of blood is obtained by pricking your finger with a lancet inserted into a lancing device, then applying the blood to a test strip that is analyzed by a blood glucose meter to give a reading of your blood glucose level (see pp.36–37). Other methods include using a continuous blood glucose monitor, which provides continuous readings of your glucose level using a sensor placed under the skin (see pp.35, 37). These are often referred to as CGMs. CGMs can provide blood glucose results automatically every five minutes without fingersticks. Flash monitoring, which provides readings using a skin sensor and separate scanner is another convenient, no-fingerstick method of monitoring glucose levels (see pp.35, 37).

The A1c test

Also sometimes called the glycosylated hemoglobin test, this test relies on the fact that, in the blood, glucose attaches to the hemoglobin molecule (the oxygen-carrying component of blood), forming a substance known as glycosylated hemoglobin, or A1c. The level of A1c is not significantly affected by recent food intake, so it provides a picture of your blood glucose level over the past two or three months and gives an indication of how well your diabetes treatment is working. The test usually involves laboratory analysis of a blood sample taken from a vein in your arm. Some clinics use a fingerstick method and analyze it with a machine on site. Typically, you will be offered an A1c check by a health professional every three to six months.



▷ **Glycosylated hemoglobin**
In red blood cells, glucose joins to hemoglobin to form glycosylated hemoglobin, or A1c. The level of A1c indicates longer-term blood glucose levels.



△ **Recommended A1c level**
If you have diabetes, the recommended level of A1c is below 7 percent, although you and your health professional may agree on a personal target range that is different from this.

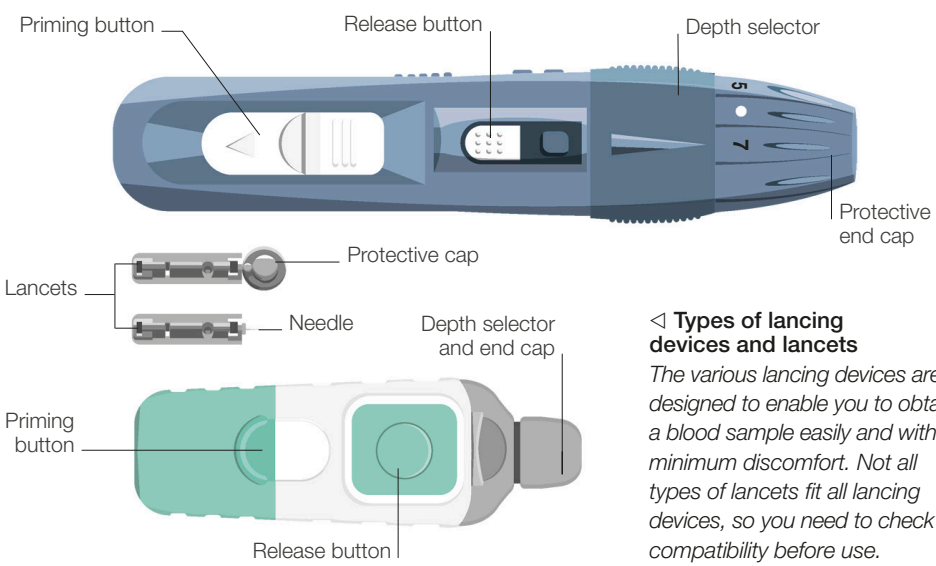
Monitoring equipment

Special equipment is available to enable you to check your blood glucose level. The most common method is fingerstick checking. This involves using a lancing device and lancet to obtain a drop of blood, which is then put on a test strip that has been inserted in a blood glucose meter. Other methods are continuous glucose monitoring and flash monitoring, which utilize sensors in the skin.

Lancing devices and lancets

A lancing device is a handheld device containing a spring and a lancet. Each lancet consists of a plastic body containing a needle, which has a protective cap over its end. Each lancet is designed to be used only once. There are different designs of lancing devices but they all typically have the same basic features: a control that enables you to alter the depth to which the lancet penetrates your skin; a priming button that compresses the spring ready for firing the lancet's needle; and a release button that fires the needle.

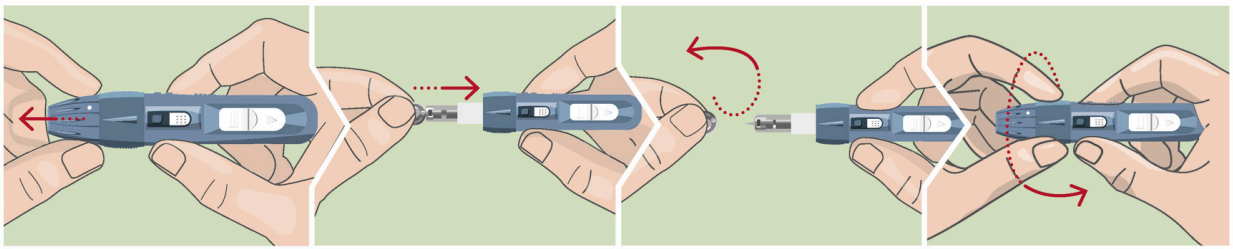
To obtain a drop of blood for a glucose check, you remove the protective end cap from the lancing device, insert a lancet, replace the cap, and adjust the depth dial to alter how deep the lancet needle penetrates (see illustration opposite). Then you prime the device, hold it against your finger, and press the release button to fire the lancet. Once you have completed your blood glucose check, you remove and dispose of the lancet in a sharps container. With single-use lancing devices, typically you only need to remove the cover, place the device against your finger, then press the release mechanism.



◁ **Types of lancing devices and lancets**
The various lancing devices are all designed to enable you to obtain a blood sample easily and with minimum discomfort. Not all types of lancets fit all lancing devices, so you need to check compatibility before use.

INSTALLING A FRESH LANCET

Different lancing devices vary in their design, features, and precise method of installing a fresh lancet. The general method shown here is applicable to many types of lancets, but you should refer to the manufacturer's instructions for specific information about installing a lancet for your particular device.



1 Remove the end cap from the lancing device. This will expose the socket into which you will insert a fresh lancet.

2 Take a fesh lancet and insert it into the exposed socket of the lancing device. Make sure you push the lancet in as far as it will go.

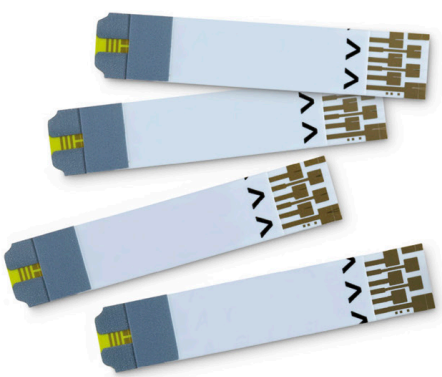
3 Twist off the lancet's protective cap to expose the needle. Take care not to contaminate the needle by allowing it to touch anything.

4 Carefully replace the end cap of the lancing device and twist the depth selector to adjust how deep the needle will penetrate.

Test strips

A glucose test strip is inserted into a blood glucose meter and then a drop of blood is applied to the end of the strip. A chemical in the strip reacts with glucose to produce a small electric current, which is detected by the meter and converted into a reading of your blood glucose level. Test strips are usually available in quantities of 25 or 50 strips per vial. The strip you use must be new and not expired. If you use a strip from a vial, replace the top immediately to protect the remaining strips.

▽ **Blood glucose test strips**
Test strips are small, disposable pieces of plastic containing a chemical that reacts with glucose in blood. Most strips are designed to be used by one type of meter.



SAFE DISPOSAL OF USED EQUIPMENT

It is important that your used lancets, disposable needles, and syringes are disposed of safely. All of these items should be discarded into a sharps container. Once an item has been put in the container, do not try to take it out again. The container should be kept in a safe place, out of the sight and reach of children. When full, the container should be sealed and disposed of according to the arrangements for your particular area. Your health professionals will be able to advise you about these.

Blood glucose meters

These are small, battery-operated devices that measure and display the level of glucose in a small sample of blood on the test strip (see Checking your blood glucose, pp.36–37). The display appears in a few seconds. You can then record the result, add it to the meter memory, or download it. There are many different meters available, with a range of functions and features. You will be given one by your health professional if they advise you to check your blood glucose level, or you can choose to buy one, or a spare one.

From time to time, it is advisable to check the accuracy of your meter. This simply involves using a control solution with a known level of glucose instead of a blood sample.

CHOOSING THE RIGHT METER

There are a number of aspects to consider when you are figuring out which is the right meter for you. As well as the points listed below, you might also want to consider the cost and/or availability of the test strips a particular meter uses.

SIZE	A compact meter is more convenient to carry, but if you have a condition that affects your dexterity, such as arthritis, you may find a larger meter easier to use.
SIZE OF BLOOD SAMPLE	The amount of blood you need to put on a test strip to obtain an accurate reading can vary according to the equipment you use. If you find it difficult to obtain blood, it may help to choose a meter that needs only a small sample.
DISPLAY	A meter with a large display may be easier to read. Some meters show the reading on its own, others display additonal information as well. More sophisticated meters enable you to customize the display.
MEMORY	Meters vary in the number of readings they can store. A large memory is useful if you cannot record or download the readings.
DOWNLOADING	Some meters allow you to download your readings and analyze them on a computer or smartphone. This enables you to see your blood glucose levels over a period in graph or table form.
AVERAGES	Many meters can give you an average of your readings over the past week or longer.
TIMING	Meters vary in how quickly they display readings. A meter with a shorter analysis time may make it easier for you to do a blood glucose check when you are busy.
ADVANCED FEATURES	Some meters can measure both blood glucose and blood ketones, others can hold multiple test strips. For those with impaired vision, some even have audible features to report the results by “talking.” Some high-tech meters contain built-in software that provides various analysis and/or display options.

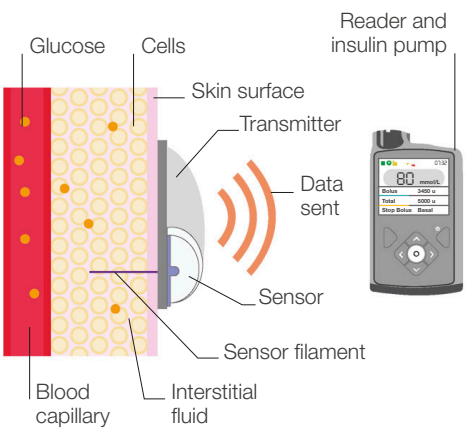
▷ **Varieties of meters**
Blood glucose meters are available in various sizes and shapes and with different added features to suit individual requirements. They all have to meet minimum standards for accuracy. Like all electronic devices, they should be kept clean and dry. Most types use standard batteries, although some models are rechargeable.

Continuous glucose monitors

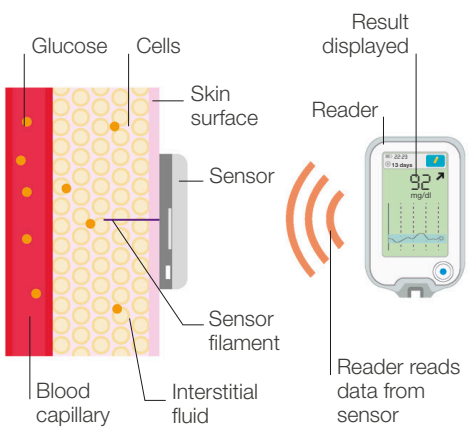
A CGM consists of a sensor, transmitter, and receiver (a handheld reader or a combined reader and insulin pump). The sensor, which is inserted into the skin, measures glucose in the fluid around the cells below your skin (known as interstitial fluid). The glucose level in this fluid mirrors the level in your blood but there might be a short time lag before the CGM reading accurately reflects your blood glucose level.

Flash monitors

Similar to a continuous glucose monitor, a flash monitor consists of a sensor inserted into the skin and a separate scanner that displays your blood glucose reading. As with a CGM, the sensor of a flash monitor measures the glucose level in interstitial fluid, which is then converted into a reading of your blood glucose level. Instead of a scanner, you can also use a compatible smartphone that has the correct app.



△ **How a continuous glucose monitor works**
A sensor detects glucose in interstitial fluid. A transmitter automatically sends data about the glucose level to a receiver, which displays your blood glucose level, or to an insulin pump with a built-in receiver, which can also manage your insulin dose.



△ **How a flash monitor works**
A flash monitor works in a similar way to a continuous glucose monitor. However, a flash monitor does not have a transmitter. You need to scan the sensor to obtain a reading of your blood glucose level.

Checking your blood glucose

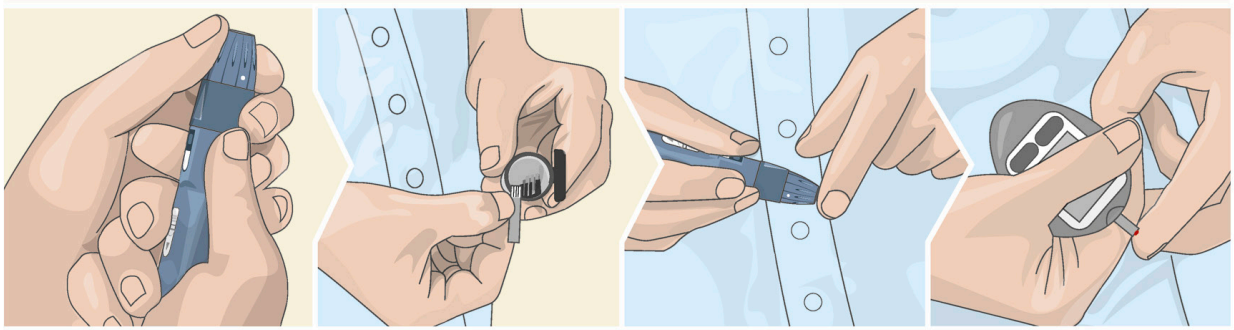
There are various ways of checking your blood glucose. The commonly used fingerstick method gives a "snapshot" reading of your glucose level. Other checking options are to use a flash monitor or a continuous glucose monitor.

Fingerstick method

This procedure gives you an immediate reading of your blood glucose level. For fingerstick readings, you need three items of equipment. The first is a lancing device for pricking your finger to get a drop of blood. This device fires a small needle, known as a lancet, into your skin; you can set the depth to which the lancet will pierce your skin. The second item is a blood glucose meter. The third is a set of test strips. You insert one end of a strip into the meter and collect a drop of your blood on the other end. The meter analyzes the information from the blood on the strip to produce a reading of your blood glucose level. You also need a sharps bin to dispose of used lancets.

DOING A FINGERSTICK CHECK

The usual site for taking a blood sample is the side of your fingertip, not too close to the nail, or the tips of your fingers, where you have more nerve endings. It is less painful on the side, fleshy part of your fingertip. Make sure you follow the manufacturer's instructions on how to use your meter correctly. Washing your hands in warm water may help to get the blood flowing.



1. Wash and dry your hands. With a fresh lancet in your lancing device, turn the device's dial to your preferred depth level. Low numbers indicate a shallow depth; higher numbers mean that the lancet will penetrate deeper.
2. Take a fresh test strip from its container. Turn on your blood glucose meter or insert the test strip into the meter to turn it on, depending on the manufacturer's instructions for your specific meter.
3. Press the tip of the lancing device on the side of your finger. Press the button to fire the lancet. Lift the device and wait a few seconds for a drop of blood to appear. (Pressing the base of your finger can help the blood flow.)
4. Once you have obtained a large enough drop of blood, apply the blood to the end of the test strip. After a short period, the meter will display a reading of your blood glucose level on its screen.

△ **Using a continuous glucose monitor**
Attach the sensor and transmitter to your skin. These continually send blood glucose data to a separate monitor, which displays your readings.

Continuous glucose monitoring

A CGM measures your glucose level continually, as often as every 5 minutes. A CGM sends your blood glucose readings to a receiver or a smartphone. A CGM can also be set up to alert you if your blood glucose becomes too high or low. Because a CGM measures glucose in the interstitial fluid (see p.35), you still need to do a fingerstick check if you need immediate information about your blood glucose level. You may need to do one or two fingersticks checks a day to ensure the CGM readings remain accurate. Some CGMs can also link to an insulin pump, to manage your insulin dose (see p.54).

△ **Using a flash monitor**
To obtain a reading, hold your flash reader or smartphone (if it has the correct app) over the sensor. The data will appear on the screen.

Flash monitoring

Like a CGM, a flash monitor measures your blood glucose continually. However, unlike with a CGM, you have to manually scan the sensor to see your readings. As well as your blood glucose level, the display also indicates whether your blood glucose level is stable, rising, or falling. In addition, flash monitors have a memory feature, but they do not have an alarm that will alert you if your blood glucose level falls outside your recommended range. It is also not possible to link them to an insulin pump. As with CGMs, you may need to do a fingerstick check from time to time to check the accuracy of readings.

RECORDING LEVELS

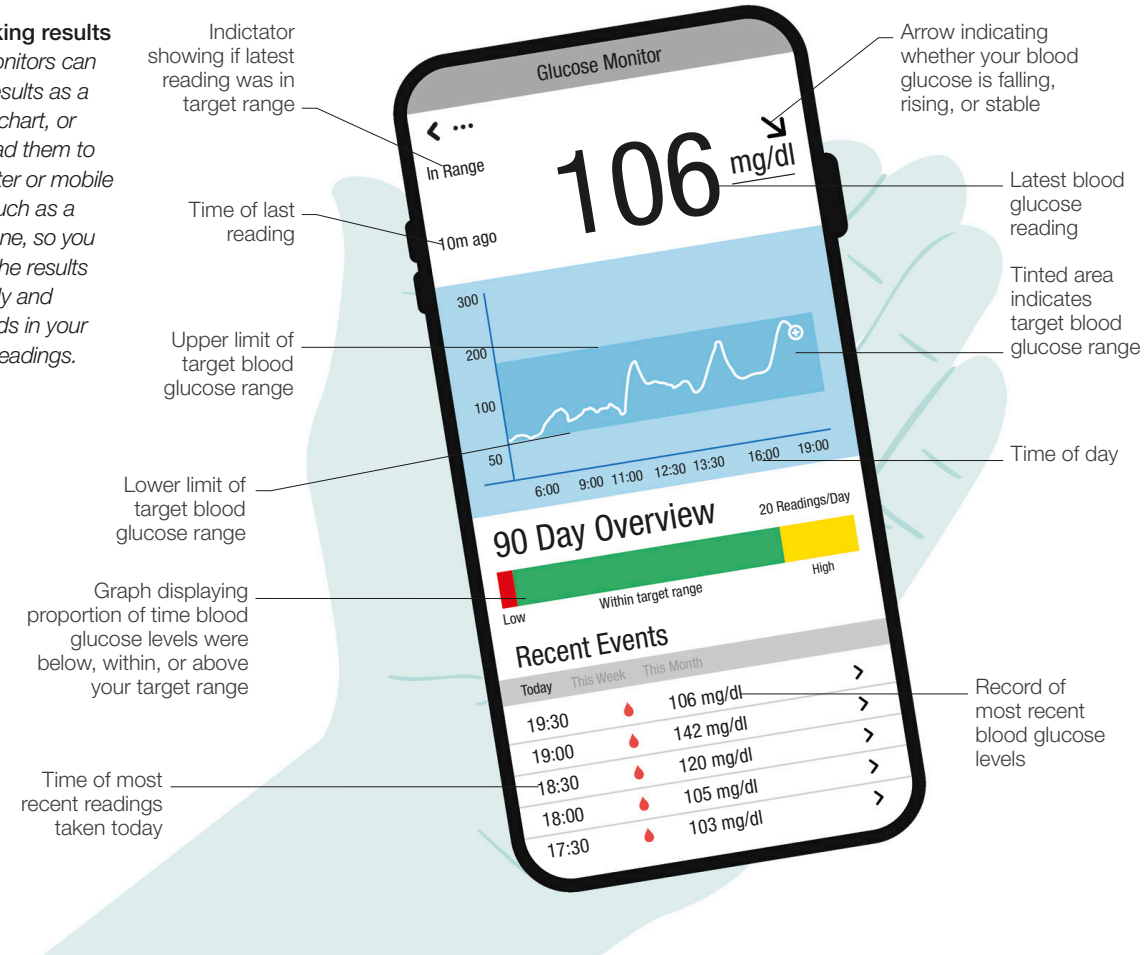
It is useful to keep a record of your glucose readings so that you can see changes over time. You can record the figures in a written diary, but many blood glucose monitoring systems enble you to upload results for storage and analysis on a smartphone, tablet, or computer. Also keep notes about your food, medication doses, and activities so that you can relate these to your blood glucose readings.

What your results may mean

Examining your blood glucose results over a period of days or weeks can give you vital information about how well you are managing your blood glucose level and what action, if any, you need to take in response.

Responding to results

It is better to look for patterns in your blood glucose readings than to focus on the occasional high or low reading. If you can view the figures as a graph or table, it is easier to spot trends: for example, whether your reading tends to be high or low at a particular time of day. The ideal range for your blood glucose is 80–180 milligrams per deciliter (mg/dl). If your results are rarely or never in this range or constantly fluctuate, try taking corrective action, such as changing your food, activity level, or medication dose. If these measures don't work, speak to your health professional—you may need a change in your medication and/or insulin regimen.



▷ **Checking results**
Some monitors can display results as a graph or chart, or can upload them to a computer or mobile device, such as a smartphone, so you can see the results graphically and spot trends in your glucose readings.

Higher blood glucose readings

In practice, a single raised reading with no obvious cause happens from time to time and does not need any action. However, if your readings are constantly raised over a day or more, you need to find the cause and take appropriate action. For example, if stress or illness raises your blood glucose for more than one or two days, you can temporarily increase your medication. If you have put on weight, you may need to increase your medication to counteract the insulin resistance this causes. Subsequent blood glucose levels will show how successful your actions have been. (For more about hyperglycemia, see pp.68–71.)

Lower blood glucose readings

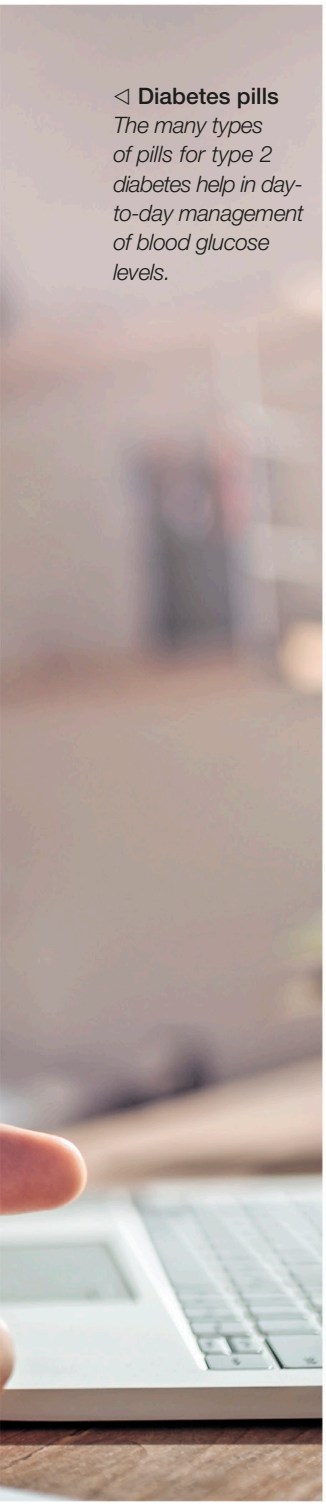
Blood glucose levels below 80 mg/dl indicate hypoglycemia and need to be treated immediately (see pp.66–67). If your levels often fall below 80 mg/dl, this can reduce your awareness of the signs of hypoglycemia. If you have had low blood glucose, work out the cause and then closely monitor your blood glucose levels to enable you to plan ahead to help maintain your target levels.

Rather than focusing on the occasional high or low result, look for patterns

COMMON CAUSES OF HIGHS AND LOWS

An occasional out-of-range blood glucose result does not indicate that you need to make changes (although a low blood glucose level should always be treated promptly). However, if you notice a pattern of highs or lows, or constant fluctuations, finding out why can help you take corrective action.

HIGHER READINGS	LOWER READINGS
Eating more food than usual or a different type of food. (A specific food may be a cause if it's associated with high readings on several occasions.)	Eating less food than usual, or taking your insulin and/or medication and then being unable to eat at the planned time.
Being less physically active than usual.	Being more physically active than usual.
Illness can cause a high blood glucose reading, as can stress hormones.	Stress can make your blood glucose level fall if you respond to it by using up more energy or eating less than usual.
Forgetting to take your medication or your insulin or taking an insufficient dose.	Taking an extra dose of medication, injecting more than your usual dose of insulin, or being on too high a dose of medication or insulin.
Putting on weight.	Losing weight.
Special circumstances, such as having low blood glucose that you treated earlier in the day, leading to hyperglycemia by eating too many carbohydrates. It is easy to take in more glucose than needed when hypoglycemic.	Special circumstances, such as drinking a lot of alcohol without compensating by eating carbohydrate-containing food at the same time or reducing your dosage of medication.



◁ **Diabetes pills**
The many types of pills for type 2 diabetes help in day-to-day management of blood glucose levels.

Medication for diabetes

Medication will help you to manage your blood glucose levels, but which treatment will depend on the type of diabetes, along with other factors. If you have type 1 diabetes, you will need insulin; type 2 diabetes is usually treated with pills and lifestyle changes. If you need them, insulin or non-insulin injections may also be added.

Who needs medication?

Anyone diagnosed as having type 1 diabetes will have to start taking insulin immediately. If you are diagnosed with type 2 diabetes, you are likely to start on pills, although you may eventually need insulin as well, if pills alone don't keep your blood glucose levels within a healthy range. The point at which medication starts for type 2 diabetes depends on whether you have symptoms and on your blood glucose level.

Good management of your diabetes with insulin or pills will help to slow or halt the development of complications, for example, eye and kidney problems (see pp.180–187).

Insulin treatment

Insulin is taken by injection, via a pump (see pp.52–55), or inhaled so that it can get straight into your bloodstream. Insulin can't be taken as a pill because it would be destroyed by your digestive system. The insulin used today is human or analogue insulin, which means it has been manufactured in a laboratory to work in a way similar to the insulin produced by a human pancreas. See pp.42–57 for more information about insulin treatment.

Pills and other medication

Pills are used to help manage type 2 diabetes. They work mainly by stimulating the pancreas to produce more insulin or enabling body cells to take up and use naturally produced insulin effectively. If you have type 2 diabetes, your health professional will assess which pill may suit you best, based on factors such as your weight and lifestyle, for example, and discuss the choices with you.

Incretin mimetics (GLP-1 receptor agonists) are drugs that have to be taken as an injection. These drugs increase insulin production, reduce your appetite, and help your ability to feel full after eating.

People with type 2 diabetes may need both pills and insulin to manage their diabetes and stay healthy

Insulin treatment

Insulin is essential when you have type 1 diabetes and may be part of your treatment at some point when you have type 2 diabetes. There are many types and regimens of insulin (see pp.44–47), and these can be adapted and the doses adjusted to help you get the best fit for your diabetes and your day-to-day life.

GET EMERGENCY MEDICAL HELP

- Taking too much insulin can lead to hypoglycemia (see pp.62–67). This may be severe, especially if you haven't eaten recently or are drinking alcohol. In these circumstances, getting emergency help is essential.

Who needs insulin?

Insulin is an essential hormone—without it your body cells cannot take in glucose from your blood to use for energy. If your pancreas no longer produces insulin, or it produces so little that the medication you take for diabetes is no longer effective, you will need an external source of insulin, usually in the form of regular injections prescribed by your health professional.

If you have type 1 diabetes, your life depends on receiving insulin by injection or insulin pump. If you have type 2 diabetes or MODY (see p.17), and your blood glucose level consistently rises above the recommended ranges with other types of medication, you will also be prescribed insulin.

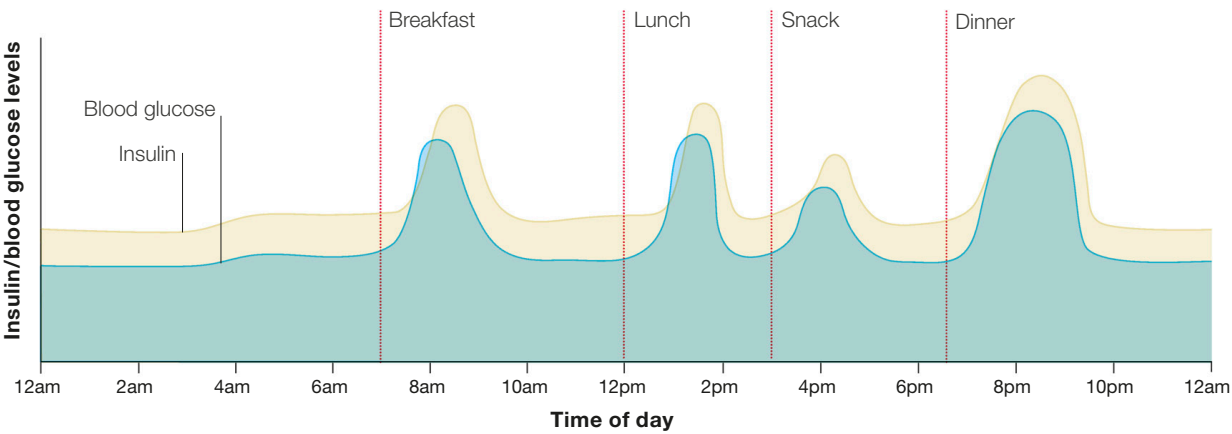
Insulin may also be needed on a short-term basis—for example, if you are sick or having surgery your insulin needs may be higher. Women who have type 2 diabetes will sometimes need to switch from pills to insulin if they become pregnant. Some women with gestational diabetes (see pp.136–137) need insulin while pregnant if changes to food intake and activity do not keep blood glucose levels within the ideal range for pregnancy.

△ **Insulin injection devices**
There is a range of devices for injecting insulin, including disposable devices such as this one.

How insulin works

In people without diabetes, insulin is naturally released in the right amounts at the right times to maintain a steady level of glucose in the blood. It does this by enabling the body's cells to take in glucose and the liver and muscles to store glucose in the form of glycogen. Insulin also plays an important part in preventing glycogen from being converted back into glucose. This stops the blood glucose level from rising unnecessarily. The insulin you take aims to mimic the natural way insulin is released in your body, which is to rise and fall according to the level of glucose in your blood.

▽ **Blood glucose and insulin levels without diabetes**
The pancreas maintains a background level of insulin and produces extra insulin to deal with rises in blood glucose after eating and drinking.



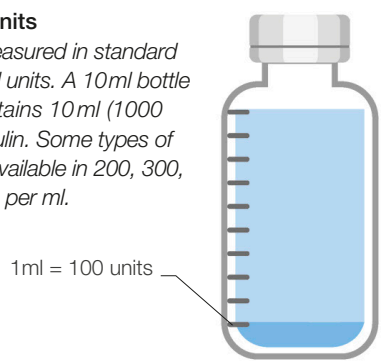
Insulin strength and dose

Insulin is measured in International Units, or "units" for short. There are 100 units to every milliliter (ml). Insulin usually comes in either a small 10 ml (1000 u) glass bottle, a 3 ml (300u) cartridge, or a 3 ml (300 u) delivery device. Unlike other forms of medication, such as painkillers or antibiotics, there is no universal maximum dose of insulin.

Everyone's needs are different and your insulin dose will be tailored to what is right for you. You will usually start on a small dose (10–20 units per day) and increase or decrease this to keep your blood glucose level between. The amount of insulin you need to keep your blood glucose level within this range will vary according to different circumstances (see pp.48–51). Talk with your doctor about your target range.

Insulin dose treatment should keep blood glucose within your recommended range

▷ **Insulin units**
Insulin is measured in standard international units. A 10ml bottle usually contains 10 ml (1000 units) of insulin. Some types of insulin are available in 200, 300, or 500 units per ml.



Types of insulin

If you need insulin to manage your diabetes, you will be prescribed one or more of four main types. The difference between each type is the length of time it works in your body after injecting. You may need to change types or use different combinations from time to time.

△ **Clear and cloudy** *Short- and rapid-acting insulins are always clear; intermediate-acting and premixed insulins are cloudy.*

Rapid-acting insulin

This clear insulin starts within minutes (see chart, right) so can be injected just before or up to 15 minutes before eating. It is the insulin used for continuous delivery (see pp.54–55). It lasts long enough to deal with the rise in blood glucose resulting from a meal, but your blood glucose level will rise once it starts to wear off. The rapid action time means that you are less likely to have low blood glucose (see pp.62–63) between meals.

Short-acting insulin

Also called regular insulin, this takes 30–60 minutes to work, so you need to leave 20–30 minutes between injecting and eating. It can keep working for up to 9 hours, and you may need to balance its action by having a carbohydrate snack 2–3 hours after a meal to prevent your blood glucose level from falling below 70 mg/dl and causing low blood glucose. You also need a longer-acting insulin to ensure you have insulin available through the day and night.

Intermediate-acting insulin

This cloudy insulin, also called NPH insulin, helps to keep your blood glucose level in your target range throughout the day. However, you may need to eat something around its peak action time to prevent low blood glucose. If you have type 1 diabetes, you may be prescribed a long-acting insulin with a shorter-acting insulin to stop your blood glucose level from rising too high after you eat. If you have type 2 diabetes, you may be prescribed intermediate-acting insulin in this way, or on its own, or with other types of medication (see pp.58–59).

Long-acting insulin

This clear insulin starts working within 1–2 hours and is effective for 24 hours or more. It doesn't have a peak action, so you are less likely to have low blood glucose than with some other insulins. If you have type 1 diabetes, you may be prescribed a long-acting insulin with rapid-acting insulin given separately to cover the rise in blood glucose at mealtimes. If you have type 2 diabetes, you may be prescribed long-acting insulin in this way, or on its own, or with other diabetes medications.

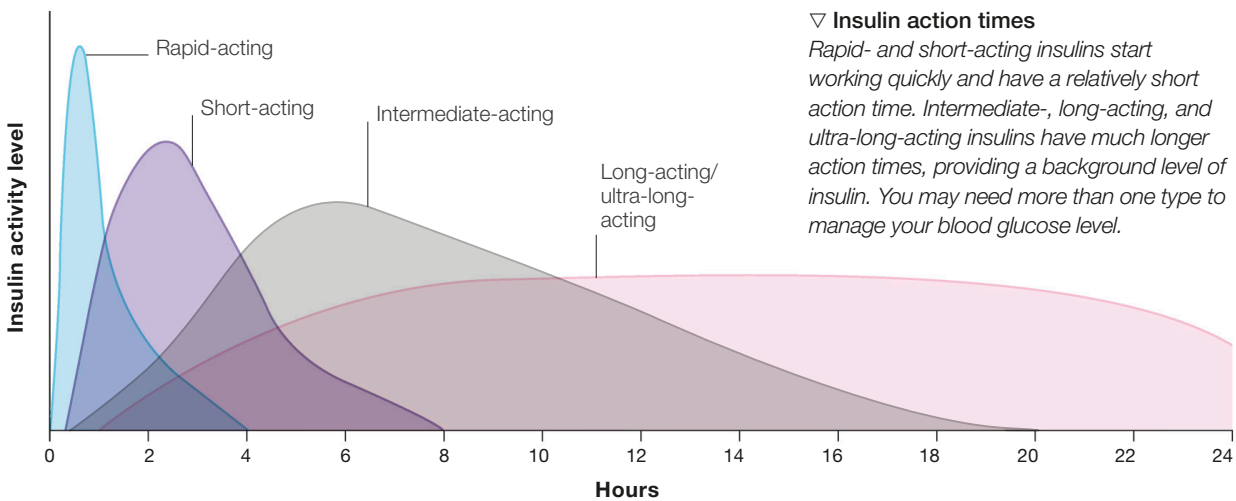
PREMIXED INSULINS

These ready-made combinations of rapid- or short-acting and intermediate-acting insulin come in a range of fixed proportions. Examples include 70/30 aspart protamine/insulin aspart and 70/30 lispro protamine/insulin lispro. They work within 30 minutes and last for 12–14 hours. Usually injected twice a day, they are useful if you want to limit injections and if you have regular mealtimes.

INSULIN TYPES AND ACTION

If you have type 1 diabetes, you are most likely to be prescribed a rapid- or short-acting insulin to be taken every time you eat, along with a longer-acting insulin. If you have type 2 diabetes and need insulin, you will most likely use an intermediate- or long-acting insulin. Knowing the peak time of insulin action allows you to be aware of when you might need a carbohydrate-containing snack in order to prevent hypoglycemia.

TYPE AND EXAMPLES	START OF ACTION	TIME OF PEAK ACTION	DURATION OF ACTION	USAGE NOTES
Rapid-acting (insulin aspart, insulin lispro, glulisine, inhalation powder human insulin)	5–15 mins	1–2 hours	2–5 hours	Prescribed for type 1 or type 2 diabetes, usually by injection or pump, though it may also be in an inhaled form. Usually taken at mealtimes.
Short-acting (regular insulin)	30–60 mins	1-4 hours	Up to 9 hours	Prescribed for type 1 and type 2 diabetes by injection. May need a carbohydrate snack around time of peak action to prevent hypoglycemia.
Intermediate-acting (NPH insulin)	1–2 hours	3–12 hours	11–24 hours	May need a carbohydrate snack around time of peak action to prevent hypoglycemia.
Long-acting (long-acting insulin analogues: insulin detemir, insulin glargine)	1–2 hours	None	May last up to 24 hours	Provides steady background level of insulin. Prescribed for type 1 diabetes along with rapid-acting insulin at mealtimes. For type 2 diabetes, it may be prescribed in this way, or on its own, or in combination with other types of medication.
Ultra Long-acting (insulin degludec)	1-4 hours	None	42 hours	Provides steady background insulin. Prescribed for type 1 diabetes along with rapid-acting insulin at mealtimes. For type 2 diabetes, it may be prescribed on its own or with other types of diabetes medication.



▽ **Insulin action times**

Rapid- and short-acting insulins start working quickly and have a relatively short action time. Intermediate-, long-acting, and ultra-long-acting insulins have much longer action times, providing a background level of insulin. You may need more than one type to manage your blood glucose level.

Insulin regimens

How often you need to have your insulin dose will depend on your type of diabetes and how well your insulin is working. The aim of the different regimens is to provide the right amount of insulin to match your blood glucose levels throughout the day.

How often do I need take insulin?

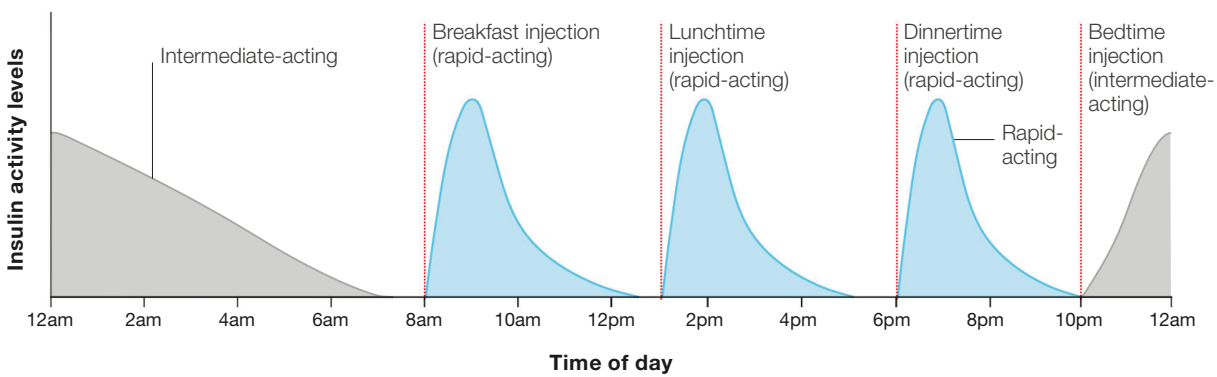
If you have type 1 diabetes, you are most likely to have multiple insulin doses every day or continuous insulin through a pump. If you have type 2 diabetes, you may have insulin once or twice a day while also taking pills.

Most people with type 1 diabetes have insulin several times a day to balance the rise in glucose at mealtimes

△ **Injecting insulin**
You may need to inject insulin several times a day to keep blood glucose within target range.

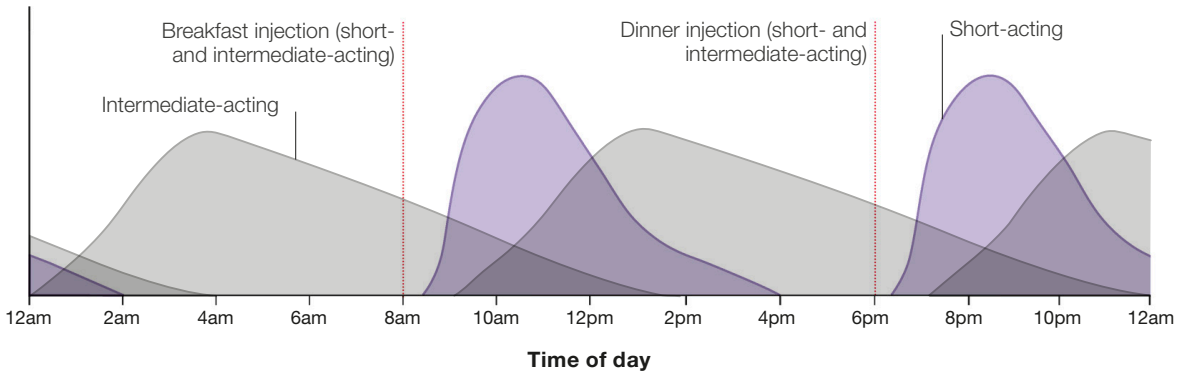
Basal–bolus or multiple daily injections (MDI)

MDI is a commonly prescribed insulin regimen. An intermediate- or long-acting insulin taken at bedtime provides a background (basal) level, while injections of rapid-acting insulin at mealtimes (bolus)deal with the rise in glucose after eating. It offers flexibility about when and what you eat and helps avoid low blood glucose. Basal insulin doses can be taken morning and evening if this helps with flexibility.



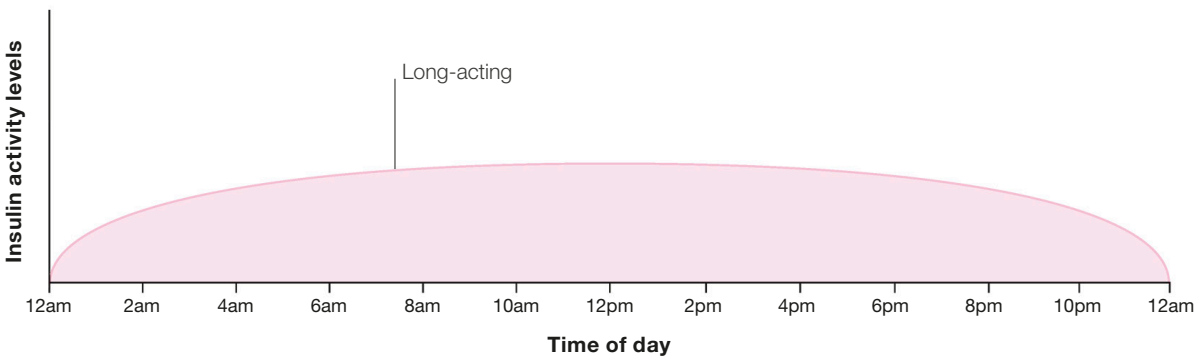
Twice a day

This regimen may be used for both type 1 and type 2 diabetes. You may be prescribed an intermediate- or long-acting insulin; an intermediate-acting insulin that comes ready-mixed with a rapid- or short-acting insulin; or an intermediate-acting insulin that you mix yourself with a rapid- or short-acting insulin. An injection in the morning takes care of your daytime blood glucose level. An evening injection acts on levels overnight. You need to balance this fixed regimen with meals and snacks.



Once a day

If you have type 2 diabetes and you need to take insulin as well as other medication, you might start with one injection a day to cover the rise in blood glucose that occurs after meals and in the morning. If you have type 1 diabetes, this regimen would not be suitable because it does not give you enough insulin to cover mealtimes. The insulin prescribed for a daily regimen is a long-acting insulin. You can inject it at bedtime or in the morning, depending on your lifestyle and to avoid low blood glucose.



CONTINUOUS DELIVERY

Insulin pumps (see pp.54–55), used by people with either type 1 or type 2 diabetes, provide a continuous delivery of insulin. A pump delivers small amounts of rapid-acting insulin, which acts like basal insulin, into your body over time. You use the pump buttons or a remote control to deliver extra doses, called boluses, at mealtimes and when your blood glucose is high. A pump can provide a more flexible lifestyle, mainly because it gives rapid-acting insulin only, so you can quickly adjust your insulin dose to meet your needs.

Adjusting insulin doses

An important aspect of diabetes management is adjusting your dose of insulin in response to changes in your blood glucose levels. The dose of insulin you need may vary when you eat different foods, change your activity level, or are ill or stressed.

When are changes needed?

You may need to change the number of injections you have as a result of changes in your life, such as pregnancy, illness, or a new job. How often you adjust your insulin dose depends on your regimen and your blood glucose levels. You may make frequent changes, or you may only adjust your dose in special circumstances. If your blood glucose levels are often outside your target range, you may be, for example, eating more or less food than you were, or you may have changed your usual level of physical activity.

You may be able to modify some aspect of your daily routine to bring your blood glucose back into range, but if not, consider adjusting your insulin dose.

It can be difficult to figure out what factors may have affected your blood glucose level, so it is useful to keep a record of key information. For example, you could record your insulin dose and blood glucose readings. You may also find it helpful to include notes that will help you to decide if you need to adjust your insulin dose. An example of a monitoring record for a multidose insulin regimen is shown on p.50; your own record may be for a range of different times rather than all of those shown. Some systems, such as continuous glucose monitors (see p.35), automatically keep a record of readings, which you can download and/or review in real time.

Adjusting a once-a-day dose

You can assess whether your insulin dose needs adjusting by checking or monitoring your blood glucose level at

If you inject insulin more than once a day, change one insulin dose at a time

KEY POINTS FOR ADJUSTING INSULIN

- Don't change your regular insulin dose in response to a single blood glucose reading.
- If your blood glucose level is high for more than a day or two, and other steps aren't working, you may need more insulin.
- If your blood glucose level is low for more than a day or two, you may need less insulin.
- Change only one insulin dose at a time, so that you can easily check the effect of the change through your blood glucose levels.
- Start by increasing or decreasing your insulin dose by 2–4 units at a time. If you usually take large doses of insulin, 40–60 units in a single dose for example, adjusting your insulin by 10% of the dose is generally reasonable.
- If you are on a twice-a-day regimen with long-acting insulin, wait at least a day before making any further changes—this insulin stays in your body for up to 24 hours, so you need this long to assess whether your dose change has worked.

different times of the day—for example, when you get up in the morning, or before each meal. If you change your dose and it hasn't improved your blood glucose level, consider making another dose change in a day or two.

Adjusting a twice-a-day dose

If you take intermediate- or long-acting insulin by itself, or intermediate-acting insulin that is premixed with a short- or rapid-acting insulin, you need to decide which of your two injections (morning or evening) you need to adjust. If you want to influence your blood glucose level before lunch, in the afternoon, and before your evening meal, you should adjust the dose of your morning injection of insulin. If you want to influence your blood glucose level in the evening, overnight, and first thing in the morning, you should adjust the dose of your evening injection. If your changes have not improved your blood glucose level, consider making another change.

Adjusting a multidose regimen

With a multidose regimen, you can make frequent adjustments to your dose of rapid- or short-acting insulin at mealtimes as well as changes to your longer-acting (basal) insulin. With rapid-acting insulin in particular, you can inject more or less insulin according to how many carbohydrates are in your meal (see panel, below). If you are sometimes not sure how much you are going to eat, you can inject rapid-acting insulin immediately after you have eaten. You can measure the effect of your insulin dose by checking your blood glucose two hours after your meal. If you use short-acting insulin and change the dose of your breakfast injection, this will affect your blood glucose level not just two hours after eating, but up until lunchtime because of its longer duration of action. Similarly, a change in your lunchtime dose continues to affect your blood glucose level in the late afternoon. Though you are correcting for an elevated glucose level two hours after a meal, hypoglycemia may occur up to four to six hours later, based on how long the insulin works. If your

▷ **Selecting the right dose**
You may need to adjust the amount of insulin you take at various times, according to changes in your lifestyle or when you are ill. Make sure you change the dose by gradual steps until you get the correct dose.

FIGURING OUT YOUR BOLUS INSULIN DOSE

Bolus insulin is part of any basal bolus regimen. Usually, a rapid- or short-acting insulin bolus is taken before, during, or sometimes just after you have eaten. To figure out how much you need, it is helpful to know your own insulin-to-carbohydrate ratio—this is the amount of insulin (in units) you need to inject for a certain amount of carbohydrates.

Insulin-to-carbohydrate ratios vary, and you will have your own personal ratio that was worked out with your health professional based on factors such as your age, weight, and type of diabetes. If your insulin-to-carbohydrate ratio is 1 unit per 10 g of carbohydrates, then for a meal with 80 g of carbohydrates, you will need to take 8 units of insulin.

blood glucose level is out of your target range between meals or first thing in the morning, you may need to change your longer-acting insulin dose. You will need to monitor your blood glucose several times over the day to assess the effect of any change because your insulin is working throughout this period (see p.45).

Adjusting a continuous dose

Insulin pumps (see pp.54–55) deliver rapid-acting insulin constantly. Checking your blood glucose level every 2–3 hours without eating in between and assessing how much the level fluctuates will tell you whether your insulin basal rate is set correctly. If your blood glucose

MULTIDOSE MONITORING RECORD

A record can help you decide when to adjust your insulin dose. With a multidose regimen, as in this example, each mealtime dose can be adjusted when your blood glucose is outside your target range.

	INSULIN TAKEN : TIME AND DOSE (INTERNATIONAL UNITS)				BLOOD GLUCOSE LEVEL (mg/dl)						NOTES
	Breakfast Basal (long-acting) + rapid-acting, mixed	Lunch Rapid-acting	Dinner Rapid-acting	Bedtime Long-acting	Before breakfast	Before lunch	Mid-afternoon	Before evening meal	Before bed	Night-time	
Sun	10+6	6	8	10	90	110	173	224	139	126	High—Sunday lunch with dessert.
Mon	10+6	6	8	10	94	102	154	190	116	102	Still high in afternoon but had no “extras” today.
Tue	10+6	8	8	10	72	89	114	126	120	62	Nighttime hypoglycemia; not sure why.
Wed	10+6	8	8	8	70	104	127	130	122	98	Lower BG in the night and early morning so reduced night-time basal dose
Thu	10+6	8	8	8	85	65	190	126	106	121	Better overnight—but lunch hypoglycemia and rebound high (due to morning aerobics)
Fri	10+4	8	8	8	120	106	124	108	118	127	Reduced morning rapid as walking to work. No hypoglycemia.
Sat	10+6	6	6	6	127	112	155	143	149	120	Less insulin because drinking in afternoon and evening; seemed to work well.

rises or falls more than 30–80 milligrams per deciliter (mg/dl), you can increase or reduce your basal rate to prevent this from happening.

Dealing with different situations

Various situations commonly cause changes in blood glucose and you will likely need to make adjustments to your insulin.

Eating out

If you are eating out or just eat more than usual, you can prevent your blood glucose from rising above your target by increasing your insulin dose before you eat. Alternatively, if you use rapid-acting insulin, you can take extra insulin immediately after you have eaten, basing the dose on the type and size of your meal. When you increase your insulin dose, figure out how long the insulin will stay in your body and when it will have its peak effect (see p.45) so that you can avoid a low blood glucose reaction.

Physical activity

Your blood glucose may fall in response to physical activity (see pp.104–107). If you are going to be more active than usual, you may need to lower your insulin dose to avoid hypoglycemia.

Illness

A rise in blood glucose is a normal part of your body's response to illness, even if you are not eating. It can slow your recovery time as well as increase the risk of diabetic ketoacidosis (see p.71) if you have type 1 diabetes, or hyperosmolar hyperglycemic state (see p.71) if you have type 2 diabetes. It is important to increase your insulin dose, based on frequent blood glucose readings, to keep your glucose level at least below 180 mg/dl. During illness, this increase may be 2–4 units or more at each dose. Alternatively, your health professional may recommend more frequent insulin. As you recover, your blood glucose level usually falls and you will need to reduce your insulin again.

△ **Mid-exercise glucose checks**
By checking your blood glucose before and after exercise, you can determine whether or not you need to adjust your insulin dose.

Fasting

If you are otherwise well and fasting, you will need to reduce your insulin dose. With type 1 diabetes, you need a lower-than-usual dose throughout the fast. If you have type 2 diabetes, you may be able to have a much reduced insulin dose or even stop it altogether while you are fasting (your body may still be able to produce some insulin itself.)

If you are not fasting completely but are giving up some types of food, you need to tailor your insulin regimen so that you receive enough insulin when you eat but not so much that you become hypoglycemic at other times. A basal-bolus regimen using a rapid-acting insulin may be useful. Discuss the options with your health professional.

Insulin equipment and care

There is a wide variety of equipment designed to deliver insulin. The most widely used are pen devices. Insulin pumps are increasingly popular, as they make managing your insulin doses more flexible. However, the traditional needle and syringe is still useful, especially as a backup. Another important item is a sharps container, to dispose of used equipment safely.

Injection devices

The injection equipment you are prescribed depends on the type and brand of insulin you are taking, as well as your insulin regimen and dose. Insulin pens for children are similar to those for adults but usually have a half-unit dosing option to meet lower insulin requirements.

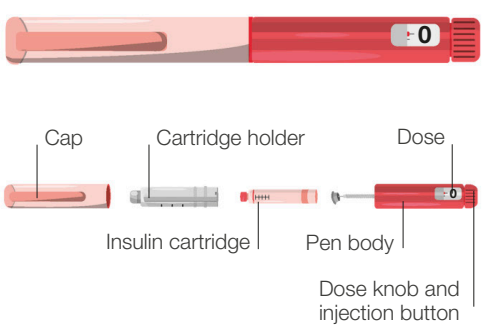
Insulin pens

There are many different insulin pens available—the main difference is whether they are reusable or disposable.

With a reusable device, you take the device apart to insert a cartridge of insulin (which typically contains 300 units) into a holder. You then reassemble the device, attach a needle, do an air shot, then dial your dose of insulin. When you have used all the insulin in the cartridge, you insert a new one. A reusable pen can last many years.

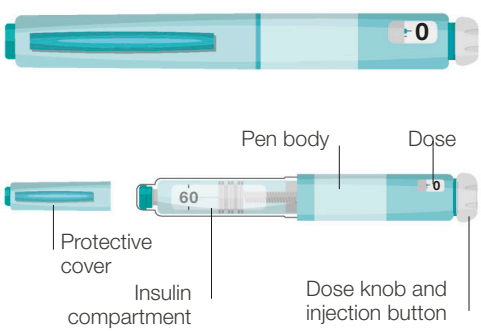
Many of the reusable insulin pens keep track of doses and delivery times. Some devices can be linked to an app where you can track your blood glucose and carbohydrate intake. These devices also calculate "insulin on board" to help determine how much insulin is still working. This information helps you to make apropriate insulin adjustments and helps to prevent hypoglycemia.

REUSABLE PEN



△ **Reusable pen devices**
These have a replaceable insulin cartridge, which is inserted into a holder. When the cartridge is empty, you replace it with a new one.

DISPOSABLE PEN



△ **Disposable pen device**
Disposable devices are prefilled with insulin; once the insulin has been used, the entire device is thrown away.

Disposable insulin pens are similar to resusable ones but have a cartridge of insulin already inside. You use it the same way as a reusable one. When it is empty, you dispose of the entire device. Disposable devices may last for a few days or several weeks, depending on how much insulin you take.

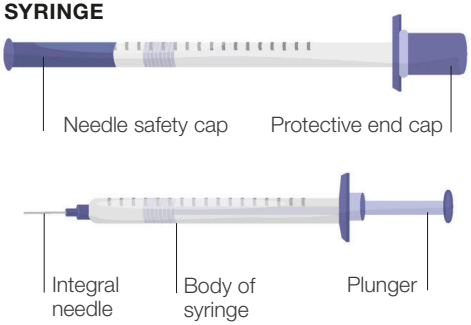
Oral inhalation devices

Rapid-acting insulin is also available in an oral inhalation powder. A cartridge is placed into the inhaler and held up to your mouth, where it is inhaled and taken in through your lungs.

Syringes

A traditional syringe consists of a plastic tube with insulin units marked on the outside and a fixed needle. You use it to draw up insulin from a bottle (see p.56). Traditional syringes are small and light, making them easy to carry, although filling them may be less convenient or discreet if you are out. They are available in various sizes to accommodate different dosages, and with varying needle lengths.

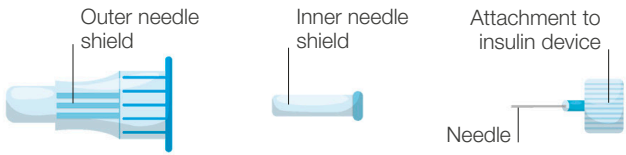
SYRINGE



△ **Traditional syringes**
These come fitted with a needle and are disposed of after a single use. They have numbers on the body to show insulin units.

NEEDLES

These attach to your injection device and must be replaced after each single use. The are available in various sizes, from 4 mm to 12.7 mm long. You will usually be offered the smallest size first, but may need to use a larger size if you experience bruising or leaking.



Injection aids

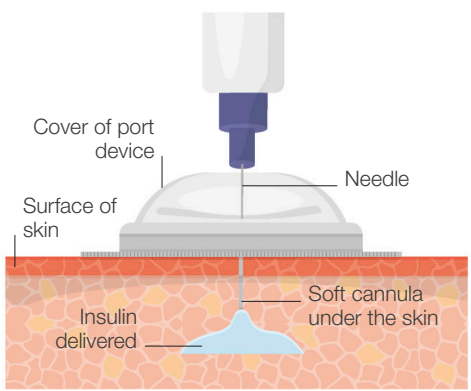
If you want to distract yourself while injecting, limit the number of times you inject, or have trouble keeping track of the doses you have taken, various devices are available to help.

Distraction aids

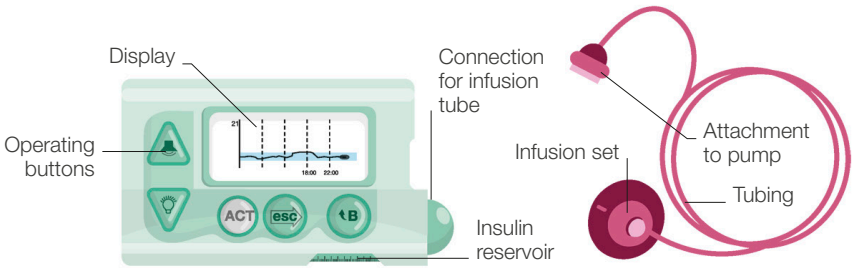
An injection distraction aid can hide the needle of an injection device or brush against the skin while the injection is being given to distract your attention.

Port device

A port device consists of a short cannula (hollow tube) attached to a cover with a small hole to accommodate a needle. the cannula is inserted into the skin. When you want to inject, you insert the needle into the



◁ **Port device**
A port device is inserted into the skin and can remain in place for several days. The cover has an adhesive so that it remains firmly attached to the skin.



◁ **Tethered insulin pump**
This type of pump has simple controls and a display screen. A refillable cartridge contains your insulin. A small plastic tube is attached to the pump at one end and to the infusion set at the other. This consists of a hollow needle (cannula) inserted under the skin and an adhesive cover.

hole and administer your dose of insulin. The insulin then travels down the cannula into your body. This device is useful for giving multiple daily doses of insulin without needing to puncture the skin each time. Instead, you change the port device every few days.

Dosage logs
These are devices that replace the protective needle cover of your pen device and automatically record the time since your previous insulin dose. More sophisticated versions can also record the amount and type of insulin, and some can link to a smartphone or mobile device to download the results, making it easier to keep track of your insulin doses.

Insulin pumps

An insulin pump is a small, battery-operated device with a reservoir that you fill with insulin; instead of a reservoir, some types accept cartridges of insulin. The pump delivers insulin either directly into you body (a patch pump) or via a fine tube connected to your abdomen through a small needle (a cannula) under your skin (a tethered pump). You change the tubing and the cannula every few days. You can program the pump to deliver continuous background (basal) insulin then give an extra dose (bolus) of insulin whenever you eat, or if your glucose level rises above your target range.

A pump will record your insulin doses and will sound an alarm if it is not working properly or if its insulin supply is running out. It will also help you calculate your bolus doses. A pump is worn continuously. You can keep a tethered one in your pocket or attached to your belt or clothes. However, you can remove it for short periods (up to about an hour), for example, for swimming or showering.

Adapting your insulin dose with a pump
Insulin pumps have various features, so you can choose the one that suits your needs. For example, if you know you will be snacking throughout a celebration or an evening out, you can set an extended bolus to prevent your blood glucose from rising above your target level. Similarly, you can reduce your basal delivery rate for when you know you will be more active than usual. Some pumps are able to suspend your insulin delivery if you are at risk of hypoglycemia. Many pumps can also be programmed using an app on a smartphone or other mobile device.

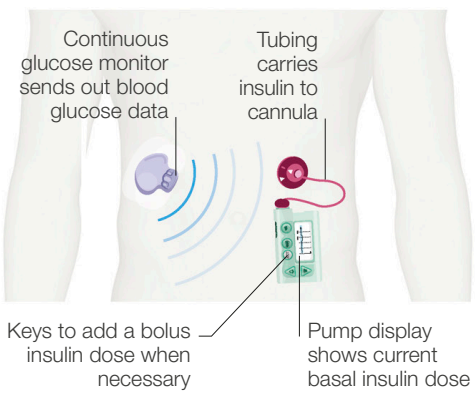
Use with a continuous glucose meter
Most insulin pumps are compatible with a continuous glucose monitor (CGM, see p.35 and p.37).The CGM reads your blood glucose level all the time and sends the information to the pump and also to a separate device, which you can use to adjust your insulin dose. Some

PROS AND CONS OF INSULIN PUMPS

Deciding whether an insulin pump is right for you is an important step. Pumps have both advantages and disadvantages, and it can be helpful to talk with your health professional before making a decision. It may also be possible to try one first to see if it benefits you.

PROS	CONS
No need for multiple injections; only need to change cannula every 2-3 days.	Feeling "attached" to your diabetes all the time.
Flexibility—for example, with meal times and physical activity.	Having to respond to alarms or prompts.
More accurately able to match insulin to different foods and activities.	Rare risk of pump malfunctioning or accidentally breaking.
Can take immediate action if blood glucose is too high or too low, and see the effect quickly.	Explaining and responding to security if staff are not familiar with or are suspicious of the pump.
Feeling more in charge of your diabetes.	If using a CGM or flash monitor, needing to wear a number of devices, and also needing to do regular fingerstick blood glucose checks.

pumps automatically adjust basal insulin delivery every few minutes, based on the CGM readings. This helps avoid blood glucose highs and lows.



△ **Continuous monitor linked with pump**
A CGM reads blood glucose levels and sends this information to the pump and also to a remote device. Some pumps can adjust the basal insulin dose in response to this information. The remote device can also be used to adjust the insulin dose.

Storage, care, and disposal

All of your equipment and supplies need to be stored, used, and replaced according to the manufacturer's recommendations. It is important to use a new infusion set (or replace your pod) every 72 hours, even if you haven't used up all of the insulin in the pump.

Unopened insulin needs to be kept in a fridge at 35–46°F. The insulin you are using can be kept out of the fridge for up to a month at temperatures of up to 77°F, provided it is kept out of direct sunlight. If it is any hotter, you will need to keep your insulin cool. From time to time, it is wise to check that your insulin supplies are within their "use by" date.

Used or expired equipment should be disposed of safely. Needles, disposable syringes, and lancets should be safely disposed of in an approved sharps container. Your health professional will advise you about safe disposal of the container.

Injecting insulin

Preparing your insulin and using the correct technique to inject is important for insulin to work effectively. The precise process of injecting yourself depends on whether you are using an insulin pen (see opposite), or a syringe (see below). You need to change your injection site each time.

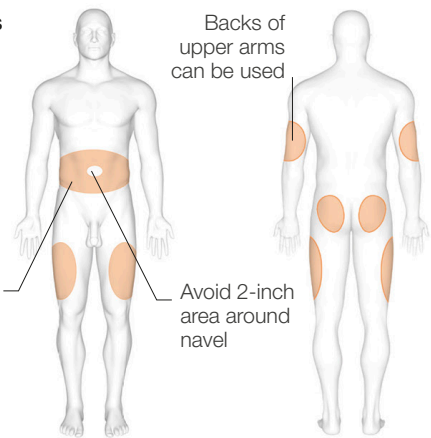
PREPARING TO INJECT

- Check your insulin's appearance and expiration date. If it's cloudy when it should be clear, has a pink tinge, looks lumpy, or contains particles even after gentle rotation, discard it and use a new bottle, cartridge, or disposable device.
- Make sure you have everything ready that you need: insulin device and new needle; a sharps bin or needle clipper; and a cotton ball or tissue in case of any bleeding.

Choosing your injection site

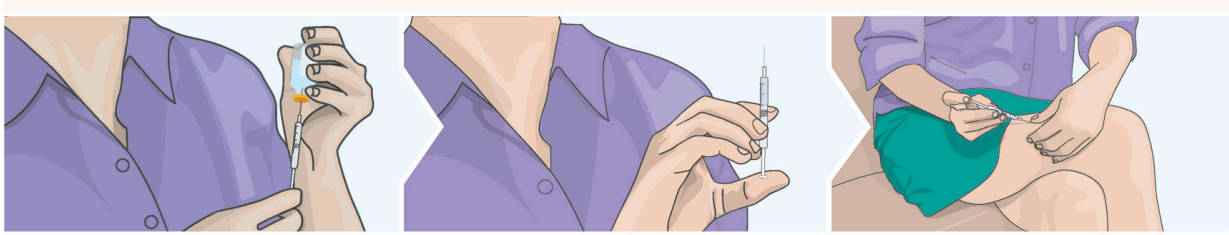
Insulin is injected into the fat layer just under your skin. Several factors might influence which site you inject. Insulin can work more quickly if injected into the abdomen rather than the buttocks, for example. It also works faster if injected just before any exercise that uses that part of the body (for example, the thigh before cycling). If using raid or short-acting insulin, injecting into the abdomen works well. You may choose to inject only in your abdomen, as long as you roatate where you inject within that site. The regular site rotation helps avoid problems with insulin absorption due to lipohypertrophy (see p.198).

▷ **Injection sites** *Insulin can be injected into any fatty area of the body, carefully avoiding muscle.*



USING A SYRINGE

Check the appearance and expiration date of your insulin and gently invert the bottle to resuspend the insulin if it's cloudy. Make sure that the top of the insulin vial is clean, and use a new syringe each time you inject. After you have injected, dispose of the syringe safely in an approved sharps container.



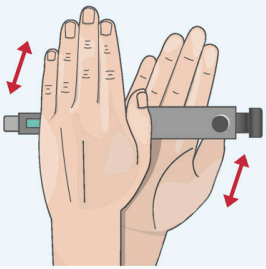
1 Draw air into the syringe to match the insulin needed. Insert the needle into the vial. Invert and check that the tip of the needle is in the insulin.

2 Pull the plunger back to draw up insulin. When you have the correct dose, withdraw the needle. With the syringe upright, flick it and then gently press the plunger to remove any air bubbles.

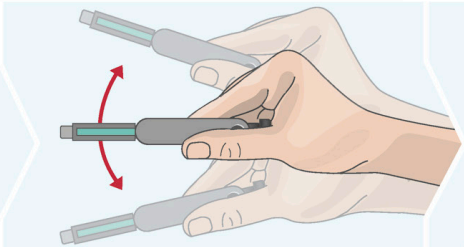
3 Check you have the correct amount, insert the needle (using the pinch-up technique if advised), and press the plunger. Hold for a count of 10 before removing.

USING AN INSULIN PEN

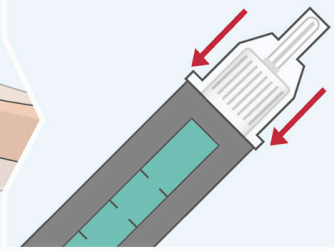
Most insulin injection pens work in the same way, although the details may vary slightly from one device to another—consult the manufacturer's instructions if you are in any doubt. Check the appearance and expiration date of your insulin before you inject. Wash your hands and make sure you have everything you need (see opposite). After you have finished, dispose of the needle as advised by your health professional.



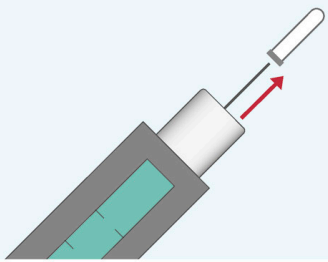
1 Pull off the outer cover of the device. If you are using premixed or cloudy insulin, roll the device between your hands 10 times.



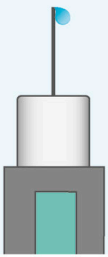
2 After rolling the device, gently invert it 10 times. (This and the preceding step is not needed for clear insulin.)



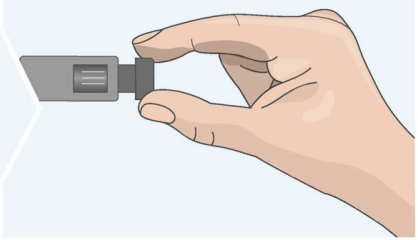
3 Take a new needle and push it on to the device, ensuring the needle is in line with the device and properly attached.



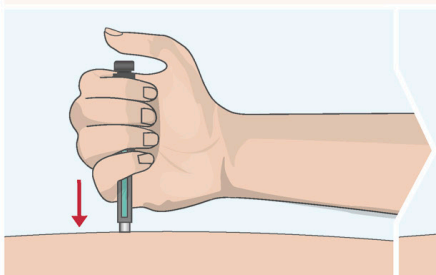
4 Twist in place. Remove the outer cap and inner cap to expose the needle.



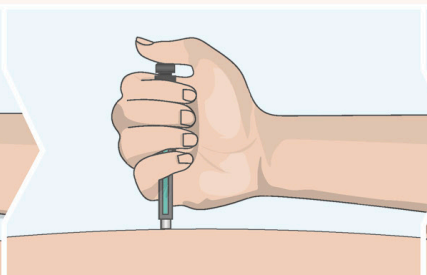
5 Holding the device upright, dial a small dose (2–4 units) and press the plunger until a drop of insulin appears at the end of the needle.



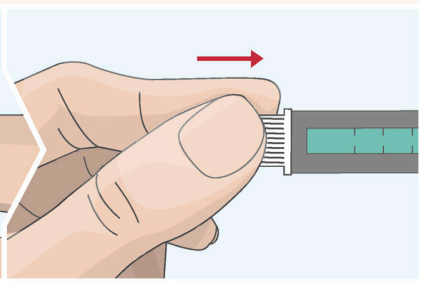
6 You are now ready to dial the dose that you need to inject.



7 Position the device at an angle of 90 degrees to your body.



8 Press the plunger, keeping it depressed to inject your dose of insulin. Ensure the dial goes back to 0, and leave in place for 10 seconds.



9 After removing the device, dispose of the needle as advised by your health professional. Replace the device's outer cover.

Other diabetes medication

If you have type 2 diabetes, you are most likely to be treated with non-insulin medication, which may be taken as pills or injections. There are many types, all of which work to manage your blood glucose levels so that you stay healthy long-term.

The right medication

Diabetes pills work in various ways to help keep blood glucose levels within the recommended range in type 2 diabetes (see chart, opposite). For example, some stimulate your pancreas to produce more insulin; others slow down glucose entering your bloodstream; and some enable your body cells to take up insulin better.

Your health professional will take into account different factors when deciding which medication to recommend for you, including your weight, lifestyle, and blood glucose level. If you are overweight, drugs that cause weight gain won't be the first choice. If your eating pattern is irregular, a drug that has a short duration of action will be better than a longer-acting one. Medication is initially prescribed on a trial basis to see how effective it is in improving your blood glucose. You may have an A1c check (see p.31) after 3 months to see how well your medication is working. If your A1c level remains outside your target range, the dose may be increased or another medication added.

You may need to try more than one medication, or different combinations, before you find what works best for you

REMEMBERING TO TAKE YOUR MEDICATION

- Using a pill organizer, labeled with the days of the week and times of day, is helpful to keep track of your medication.
- Put the medication in a place that will remind you to take it.
- If necessary, set an alert or alarm on your mobile phone, computer, or other device to remind you to take your medication.
- If possible, ask someone to remind you at the time you need to take your medication.
- If you are traveling, take extra medicaton in your carry-on in case you are delayed.
- Keep a supply of medication with you so you can take it wherever you are.

▷ **Taking medication**
You need to take your medication regularly as prescribed, so it can work most effectively.

MEDICATIONS FOR TYPE 2 DIABETES

Different medications have different actions, doses, and side effects. Speak to your health professional if you have any concerns about the medication you take. Most drugs are not recommended if you are pregnant or breastfeeding. Never exceed the daily dose or stop taking your medication without consulting your health professional first.

MEDICATION TYPE AND ACTION	EXAMPLES	HOW TAKEN AND WHEN TO TAKE	POSSIBLE SIDE EFFECTS
Sulfonylureas Increase the amount of insulin the pancreas produces; also increase the effectiveness of insulin	Glipizide, glimepiride, glyburide	Pills; taken once or twice a day, with or shortly before a meal	Weight gain; hypoglycemia
Prandial glucose regulators (meglitinides) Similar to sulfonylureas, increase the amount of insulin the pancreas produces	Nateglinide, repaglinide	Pills; taken within 30 minutes of starting a meal	Weight gain; hypoglycemia. Side effects less than those produced by sulfonylureas
Biguanides Increase the body cells' sensitivity to insulin; also reduce glucose production by the liver	Metformin XR extended release	Pills; taken once a day with food	Nausea; diarrhea; abdominal pain
	Metformin immediate release	Pills; taken two to three times daily with food	
Alpha glucosidase inhibitors Slow down the digestion of carbohydrates in starchy foods, which slows glucose entering bloodstream	Acarbose, miglitol	Pills; taken at the start of, or immediately before, a meal	Flatulence; diarrhea
Glitazones (thiazolidinediones) Reduce body cells' resistance to insulin so help cells to absorb insulin better	Pioglitazone, rosiglitazone	Pills; taken once or twice daily, with or without food	Visual disturbance; weight gain; fluid retention
Gliptins (DPP-4 inhibitors) Slow down digestion and decrease appetite; lower blood glucose levels	Sitagliptin, vildagliptin, saxagliptin, alogliptin, linagliptin	Pills; once a day, with or without food	Rash; upper respiratory infections; headache; nausea
SGLT2 inhibitors Cause kidneys to excrete excess glucose into the urine	Dapagliflozin, canagliflozin, empagliflozin, ertugliflozin	Pills; once a day, with or without food	Urinary tract infections; thrush (yeast infection); genital tract infections and itching
Incretin mimetics (GLP-1 analogues) Increase insulin production and reduce glucose production by liver	Exenatide, liraglutide, lixisenatide, dulaglutide, semaglutide (in oral or injection form)	By injection (semaglutide is also available in an oral form); once or twice daily or once weekly, depending on the specific medication	Nausea and/or vomiting, which are often short-lived

Advances in treatment

Diabetes is the focus of a great deal of research into potential new treatments, although it may take many years for some to become available. Recent or near-future developments include new forms of insulin, immunotherapy, islet cell transplants, and new technology.

New forms of insulin

The types of insulin currently available work in your body for a certain length of time, regardless of your blood glucose level. Researchers are trying to develop a new form of insulin, known as glucose-responsive or "smart" insulin, that automatically responds to your blood glucose level to keep it within the recommended range. Although smart insulin is still in its experimental stages, if it proves successful it would make it much easier to manage your blood glucose level.

Immunotherapy for type 1 diabetes

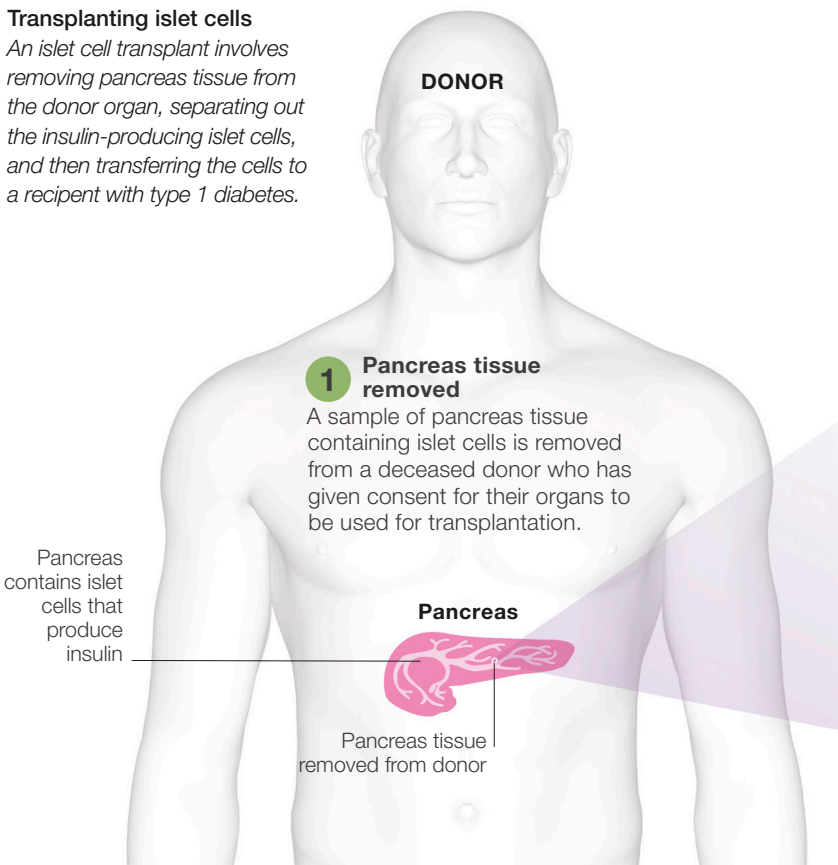
Modifying the activity of the immune system with medication—known as immunotherapy—is already being used successfully to treat rheumatoid arthritis and other autoimmune conditions in which the immune system mistakenly destroys certain body cells. Similar drug treatments are being developed for type 1 diabetes—also an autoimmune condition—with the aim of preventing the immune system from destroying the insulin-producing islet cells in the pancreas. If these new drugs prove to be effective, they could be used to delay or prevent the onset of type 1 diabetes in people who have been identified by genetic testing to be at risk of developing the condition but have not yet done so.

Islet cell transplants

The aim of an islet cell transplant is to introduce healthy, insulin-producing islet cells into a person with type 1 diabetes, whose own islet cells have been destroyed. The procedure usually works well in reducing severe hypoglycemia and improving quality of life. However, they need to take antirejection medication for the rest of their lives, and this can produce side

Transplanting islet cells

An islet cell transplant involves removing pancreas tissue from the donor organ, separating out the insulin-producing islet cells, and then transferring the cells to a recipent with type 1 diabetes.



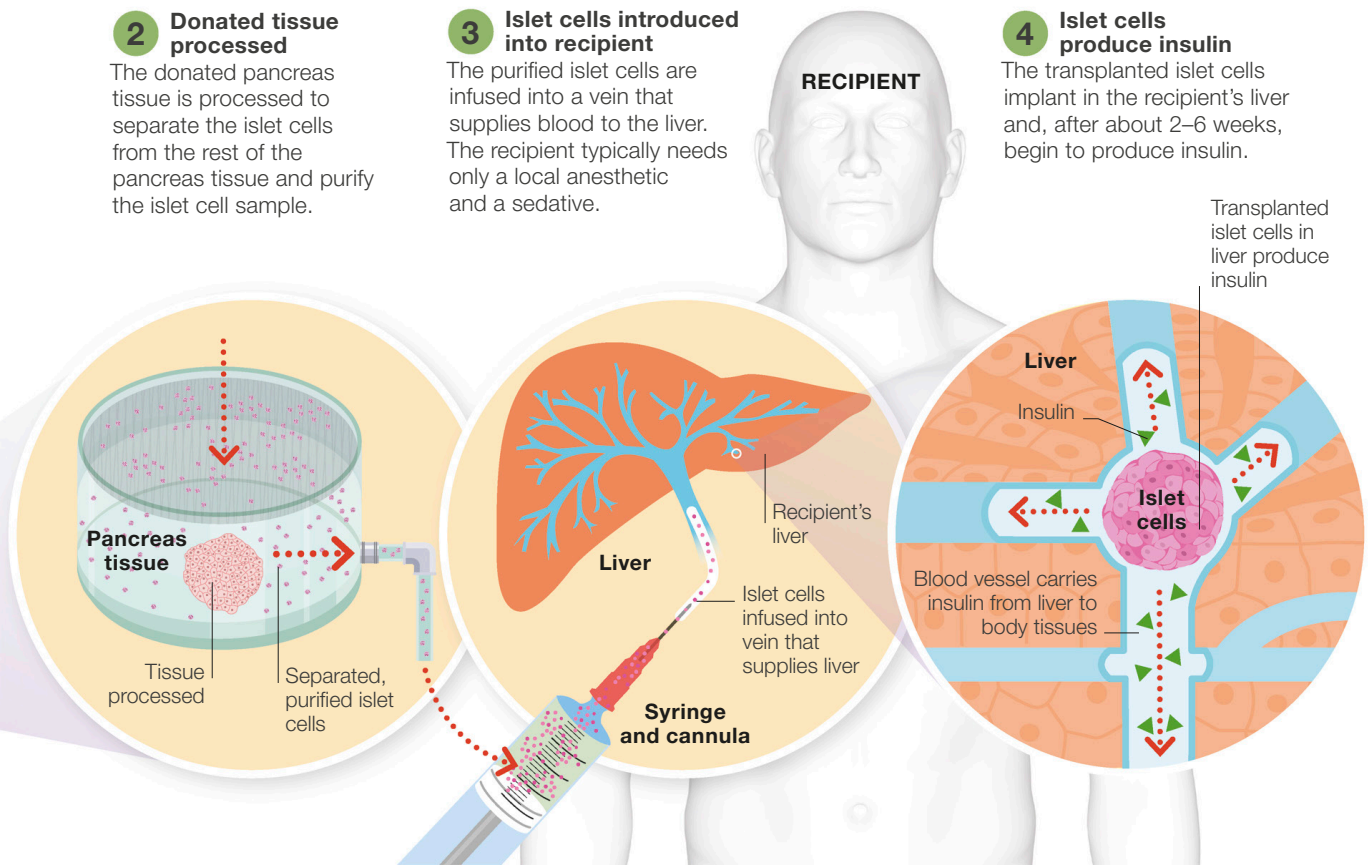
effects. In addition, many recipients still need to take some insulin after a transplant, although their insulin requirements are usually lower. Not everyone is suitable for a transplant, and the number that can be performed is limited by the relatively small number of donor pancreases available.

New technology

Advances in technology are helping to make diabetes management easier and more precise. For example, smart pen devices which store data and share it to your smartphone. This allows you to easily keep track of your insulin doses, active insulin on board, carbohydrate intake, and blood glucose levels. An advance that seems likely to become more widely available in the near future is the closed loop or artificial pancreas system, consisting of an insulin pump, a continuous glucose monitor, and a communication link. The monitor sends data to a small device, which uses an algorithm to instruct the pump to adjust your insulin dose according to your blood glucose level. The system displays on your smartphone or smartwatch, and you can also revert to manual control.

TAKING PART IN RESEARCH

Research may range from simply completing a questionnaire to something more involved, such as trying new therapies. Official research requires formal consent, so that you are fully informed and can withdraw at any time. If you are interested in participating, your diabetes healthcare professionals or diabetes organizations will be able to provide up-to-date information.



Hypoglycemia

Commonly known as low blood glucose, hypoglycemia is when your blood glucose level falls too low. It is often due to a dose of insulin or insulin-stimulating medication that is too high in relation to your food intake. Being aware of the factors that trigger low blood glucose can help you to prevent it.

What is hypoglycemia?

In practical terms, low blood glucose means a blood glucose level below 70 mg/dl. Hypoglycemia occurs when there is more insulin in your body than you need at the time, typically because your insulin or medication dose does not match your food intake or level of activity. Hypoglycemia often has recognizable symptoms (see pp.64–65), but the blood glucose level at which symptoms become noticeable can vary from person to person, and symptoms may be more pronounced in some people than others.

◁ **Fitting in food**

A busy lifestyle can make it difficult to eat regularly. However, missing a meal or delaying eating puts you at risk of hypoglycemia, so it is helpful to be aware of when to eat and to set up reminders for yourself.

PREVENTING AND ACTING ON HYPOGLYCEMIA

- Keep checking your blood glucose several hours after vigorous activity as delayed hypoglycemia can occur.
- If it helps to involve others, ask your family, friends, or colleagues to remind you to check your blood glucose and to eat snacks regularly.
- Keep glucose and carbohydrate snacks handy.
- If you have frequent hypoglycemia, talk to your health professional about changing your medication type or timing to better suit your routine.

CAUSES AND PREVENTION

Various factors may trigger hypoglycemia; the more common ones are detailed in this chart. It is important to try to prevent hypoglycemia and treat it promptly (see pp.66–67) before your blood glucose drops too low, because a very low level can make you feel ill, stop you from thinking clearly, and even, in some situations, cause you to lose consciousness.

CAUSE		PREVENTION
 **Medication dose**	If you take insulin, you will likely have occasional hypoglycemia. You are also at risk of hypoglycemia if you take insulin-stimulating medications (see pp.58–59).	If you have frequent hypoglycemia, you may need a lower dose of insulin or medication. If you take insulin or other medication several times a day, it is important to identify which injection or pill is responsible for the hypoglycemia and then adjust that dose.
 **Food intake**	Injected insulin and insulin-stimulating medication work over a number of hours, and if you do not eat during this period, you risk having hypoglycemia.	If you use insulin or insulin-stimulating medication, you need to know whether it has a peak of action, and if so, when that is so that you can balance your insulin dose or medication with carbohydrate-containing food. If you are unsure about the timing of food for your particular insulin or medication regimen, talk it through with your health professional.
 **Alcohol**	Initially, alcohol causes your blood glucose to rise but then, over a period of hours, causes it to fall, putting you at risk of hypoglycemia if you take insulin or insulin-stimulating medication. Hypoglycemia due to drinking is particularly dangerous and in some circumstances can be life-threatening, because alcohol prevents your liver from releasing stored glucose efficiently.	You can prevent alcohol-induced or prolonged hypoglycemia by not drinking on an empty stomach and, if you have more than 2–3 drinks containing alcohol, by eating extra carbohydrate foods to compensate. Check your blood glucose more frequently if you choose to drink alcohol.
 **Physical activity**	Any sort of physical activity—including everyday tasks, such as housework or shopping—needs energy, which is mainly obtained from glucose. The more active you are, the more glucose you "burn" and the more your blood glucose falls.	You can prevent hypoglycemia by reducing the dose of your insulin or insulin-stimulating medication before any physical activity, or by eating extra food before, during, or after activity. Prolonged or strenuous activity requires more careful planning (see pp.100–107).
 **Stress**	Stress usually makes your blood glucose rise due to the effects of the stress hormones adrenaline and cortisol. However, in some people or situations, stress may make your blood glucose fall because your body may use extra energy when you are stressed, or if you don't eat regularly.	Try to establish what effect stress has on your blood glucose. If you know that it lowers your blood glucose, you can compensate by eating extra food or reducing your dose of insulin or insulin-stimulating medication.
 **Heat**	Exposure to heat makes your blood circulate more quickly, which means that insulin and insulin-stimulating medication work faster than usual. This, in turn, causes your blood glucose to fall. You may find that you are prone to hypoglycemia in hot conditions, even after a hot bath or sauna.	Checking your blood glucose before exposing yourself to unusual heat will help you identify if it is dropping and whether you need extra food to avoid low blood glucose. In similar situations in the future, you may need to reduce your dose of insulin or insulin-stimulating medication, or eat extra food.

Recognizing hypoglycemia

A low level of glucose in the blood—hypoglycemia—is potentially serious, but recognizing the symptoms as soon as possible usually enables the condition to be treated quickly and easily. The symptoms are more pronounced in some people, and if you are not able to detect your own symptoms, you may need to rely on people around you for help.

Early warning symptoms

When your blood glucose first starts to fall, you may experience early symptoms of hypoglycemia (see table, opposite), because your body releases adrenaline in an attempt to raise your blood glucose. You may not have all or even any of these symptoms. It is also possible to experience early symptoms due to any rapid fall in blood glucose—for example, from 270 mg/dl to 180 mg/dl. Checking your blood glucose level will give you the data to decide if any action is necessary. A fingerstick check gives a "snapshot" reading but does not reveal whether your blood glucose level is changing. In contrast, a continuous monitor or flash monitor shows your glucose level and whether it is rising, falling, or constant. If you have symptoms and your test result is 80 mg/dl or lower, you should start to treat yourself immediately (see pp.66–67).

◁ **Uncharacteristic behavior**
Hypoglycemia can affect the way you behave, making you anxious, irritable, sad, or uncooperative.

EARLIER HYPOGLYCEMIA SYMPTOMS		LATER HYPOGLYCEMIA SYMPTOMS
Anxiety	Trembling	Headache; difficulty in concentrating; disorientation; being uncooperative and/or aggressive
Dilated pupils	Palpitations; fast pulse	Blurred vision
Skin turns paler; sweating	Hunger	Slurred speech
Tingling of lips	Nausea	Unsteady movements

Later symptoms

When your blood glucose falls below about 54 mg/dl, your brain does not receive enough glucose to function properly. As a result, many of the later symptoms of hypoglycemia affect mental functioning. Sometimes, you may know that you are hypoglycemic but may not be able to think clearly enough to treat yourself and may need help. Your family, friends, and colleagues can become skilled at recognizing hypoglycemia and giving you or encouraging you to accept treatment. Without treatment, you may have a seizure or lose consciousness if your blood glucose continues to fall.

Reduced awareness of symptoms

Over a long period of time, or if you have a period of frequent low blood glucose, your body can become less efficient at giving early warnings. If you have had diabetes for years and have often had hypoglycemia, you may not have any warning signs, and your only symptoms may be confusion and disorientation. Without help, you may lose consciousness. If you do have frequent hypoglycemia and reduced awareness of symptoms, your health professional may suggest that you temporarily allow your blood glucose to stay higher than your usual targets to give you a break from hypoglycemia and help restore your awareness of symptoms.

Hypoglycemia may not always produce warning symptoms

CONTINUOUS BLOOD GLUCOSE MONITORS AND FLASH MONITORS

These types of monitors display both your blood glucose level and its direction of change. Some continuous monitors can also be set up to sound an alarm when you are heading for low blood glucose, so that you can take action to prevent it. You may need to confirm your level with a fingerstick check, as there is a short time lag between your true blood glucose level and the reading shown by the monitor.

Treating hypoglycemia

It is usually possible to treat low blood glucose yourself if you recognize the symptoms early. However, if hypoglycemia becomes more severe, you may need help. In some situations, you may need emergency medical treatment.

GET EMERGENCY MEDICAL HELP

- If your usual treatment isn't working and you continue to be hypoglycemic.
- If a person having low blood glucose has been drinking alcohol.
- If a person having hypoglycemia has a seizure.
- If a person having hypoglycemia becomes unconscious and there is nobody to inject glucagon or a glucagon kit is not available.

Treating early hypoglycemia

As soon as you realize that you are having low blood glucose, you must eat or drink something sugary immediately to raise your blood glucose: the panel (below right) gives some suitable examples. Any of these will raise your blood glucose within about 10–15 minutes and you will usually begin to recover. Afterward, you need to eat something more substantial that contains carbohydrates, such as a sandwich, a piece of fruit, or a bowl of cereal. The exact amount you need to eat depends on the circumstances. For example, you will need to eat more if you won't be eating again for a while, whereas if you have hypoglycemia just before a meal containing carbohydrates, the meal may be enough to recover fully.

Treating advanced hypoglycemia

If you are already in the later stages of hypoglycemia, you may be confused, losing consciousness, or unconscious. In this situation, it is dangerous to eat or drink anything. Instead, you need an injection of glucagon (a hormone that causes glucose to be released from your liver into your bloodstream) or glucose to quickly raise your blood glucose level.

To be prepared for this possibility, your health professional will prescribe you glucagon, and they can show a friend or relative how to inject it. If there is nobody available who knows how to give you glucagon, you will need medical help.

You can treat hypoglycemia in its early stages by eating or drinking something high in sugar

RAISING YOUR BLOOD GLUCOSE QUICKLY

As soon as you notice symptoms of hypoglycemia, you need to raise your blood glucose quickly to prevent it from getting worse. You can do this by eating or drinking a fast-acting carbohydrate. This could be:

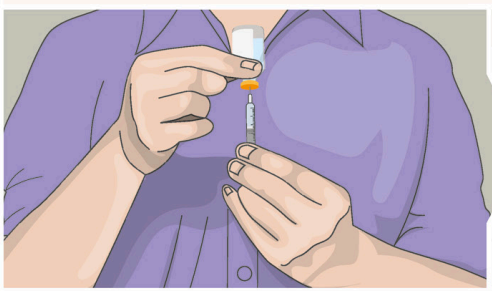
	4 glucose or dextrose tablets
	6 large or 12 small jelly babies or jelly beans
	A small glass (4 oz/120–200ml) of regular soda
	A small carton (4 oz/200ml) of pure fruit juice
	1 tube of glucose or dextrose gel

TREATING HYPOGLYCEMIA IN AN UNCONSCIOUS PERSON

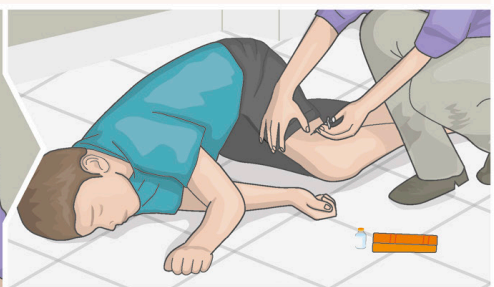
If hypoglycemia causes unconsciousness, you will need to give the person a glucagon injection, if you have been trained how to do so. If a glucagon injection kit is not available or you have not been shown how to inject, you need to get emergency medical help.

1 Put the person in the recovery position: on their side, with their arms and legs at right angles to their body, and their head tilted back to keep the airway clear.

2 If you have a glucagon injection kit, remove the seal on the glucagon bottle. Uncap the needle, put it into the bottle, and inject the liquid from the syringe into the bottle.



3 Rotate the bottle until all the powder has dissolved. Turn the bottle upside down and put the needle tip in the solution. Pull back the plunger to withdraw all the solution or the dose you as prescribed.



4 Insert the needle at a right angle to the person's thigh, buttock, or arm, and press the plunger to inject. Withdraw the needle, press a tissue/swab against the injection site, and keep the person in the recovery position until they are conscious.

The recovery period

If you don't receive treatment for severe hypoglycemia and you lose consciousness, this could be a life-threatening situation. Any time you have severe hypoglycemia you need assistance from others. If you lose consciousness, emergency medical help is usually needed. During the recovery period, your blood glucose may rise too high (rebound hyperglycemia). This may happen soon after low blood glucose or during the following 24 hours. If you take rapid-acting insulin, a small dose can correct rebound hyperglycemia, but increasing the dose of other insulins may cause further low blood glucose. Instead, try to figure out the cause of your hypoglycemia in order to prevent a recurrence (see pp.62–63).

Hyperglycemia

A blood glucose level that is too high is known as hyperglycemia. It is the main effect of untreated diabetes. Your diabetes treatment is aimed at reducing hyperglycemia while also avoiding hypoglycemia (low blood glucose, see pp.62–63).

What is hyperglycemia?

If your blood glucose level is above 200 milligrams per deciliter (200 mg/dl), the condition is known as hyperglycemia. It may not only make you feel sick in the short term but it may, if it occurs frequently, increase your risk of long-term complications. This is why a blood glucose level of 80–130 mg/dl is recommended for good diabetes management. Although diabetes treatment aims to prevent hyperglycemia, in practice, periods of raised blood glucose levels (130–180 mg/dl) are to be expected. Hyperglycemia can affect anyone with diabetes, whether you take insulin, other medication, or manage your diabetes through food and activity.

GENERAL PREVENTIVE MEASURES

- If you know you are going to eat more carbohydrates than usual, adjust your insulin or medication, or be more active.
- Be aware of the effect of stress and other hormonal changes on your blood glucose so you can predict when you need to adjust your treatment.
- Don't stop taking your insulin or other medication when you are ill, and monitor your blood glucose frequently.
- Take your insulin or medication every day, and adjust the dose when necessary.

▽ **When you are ill**
Illness often causes your blood glucose to rise. Keep taking your diabetes medication and monitor your blood glucose frequently so that you know if you need to adjust your medication dosage or timing.

POSSIBLE CAUSES AND PREVENTION

A wide variety of factors may lead to hyperglycemia. You can identify the specific cause of hyperglycemic episodes that affect you by checking your blood glucose level regularly and relating the level to your circumstances at the time, which can help you prevent further episodes in the future.

CAUSE		PREVENTION
 **Food intake/ physical activity**	Probably the most common causes of hyperglycemia are an increase in the amount you eat (especially carbohydrates) or a decrease in physical activity, or a combination of both. Occasionally, an increase in physical activity may cause hyperglycemia (see pp.104–105).	You can help to prevent hyperglycemia by following healthy eating guidelines (see pp.74–75), staying active (see pp.100–103), and paying attention to balancing your food intake and medication. If you have type 2 diabetes that you manage with food and activity but find that your blood glucose is raised frequently, you should talk with your health professional because you may need to start taking medication to manage your diabetes.
 **Illness**	When you are ill, more glucose is released by the liver into your bloodstream. Increased amounts of the stress hormones cortisol and adrenaline are also produced. They interfere with the action of insulin, also causing your blood glucose to rise.	Frequent blood glucose monitoring when you are ill enables you to quickly adjust your diabetes treatment to compensate for your raised blood glucose level (see pp.70–71), or get advice from your health professional.
 **Stress/ hormonal changes**	Stress hormones can disrupt the action of insulin, causing your blood glucose to rise. When you are stressed, you may overeat or eat less healthy foods, which can also cause your blood glucose to rise. If you are a woman, you may find that your blood glucose rises at certain stages of your menstrual cycle (particularly just before your period). Hormonal changes during menopause can also cause hyperglycemia, as can some hormonal disorders, such as Cushing's syndrome (abnormally high levels of corticosteroid hormones).	If you find that stress or other hormonal changes raise your blood glucose, increase the frequency of blood glucose monitoring (or start monitoring, if you are not already doing so) and, if your blood glucose is raised, take action by adjusting your diabetes treatment (see pp.70–71). If your hyperglycemic episodes are due to hormonal changes, it may be possible to reduce the episodes by treating the underlying hormonal condition. Your health professional can help with this.
 **Diabetes medication**	If you have not taken your insulin or other medication, your blood glucose rises. Sometimes, your blood glucose may rise even if you have taken your insulin or medication correctly but it is no longer working effectively.	Making sure you take your insulin or other medication as recommended is crucial to avoiding hyperglycemia. If you have been doing this but are still experiencing frequent hyperglycemic episodes, your health professional may talk with you about, or advise changing to, a different dose or type of insulin or medication.

Hyperglycemia is commonly caused by an increase in carbohydrate food or a decrease in physical activity, or a combination of both

Recognizing and treating hyperglycemia

High blood glucose—hyperglycemia—is a characteristic feature of undiagnosed or undertreated diabetes. It is important to be able to identify and manage it promptly to bring your blood glucose down into your target range in order to limit its short- and long-term effects.

GET EMERGENCY MEDICAL HELP

- **Type 1 diabetes:** if your blood glucose is raised, you have symptoms of hyperglycemia, and you have any level of ketones or cannot check for ketones.
- **Type 2 diabetes:** if your blood glucose is raised and/or you have symptoms of severe hyperglycemia.

Symptoms of hyperglycemia

The typical symptoms of hyperglycemia are the same as those you may have had when diabetes was first diagnosed. However, hyperglycemia does not always produce symptoms, especially if you have type 2 diabetes or your body has become accustomed to a raised blood glucose level.

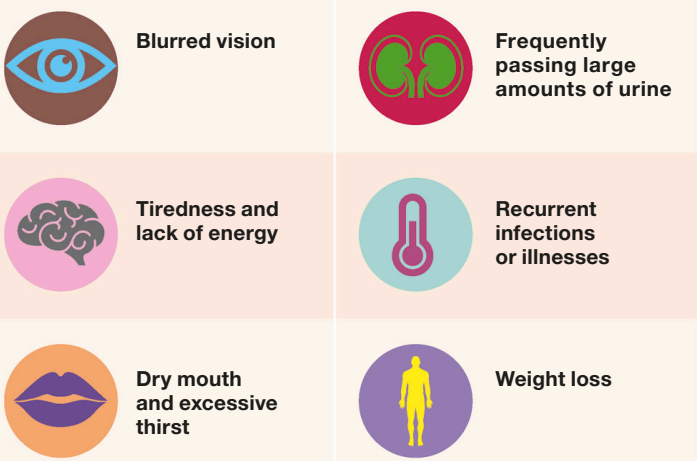
Treating hyperglycemia

If you develop hyperglycemia, you need to tailor your treatment to its cause. This could mean eating less, increasing your level of physical activity, and/or increasing your dosage of insulin or other medication (see pp.48–51 for information about adjusting your insulin dose).

If you have type 2 diabetes that you manage through eating and physical activity, talk to your health professional if your blood glucose is consistently above 160 milligrams per deciliter (160 mg/dl) because you may need to start taking medication. If you are ill, treating your illness promptly should limit the effect of hyperglycemia (see pp.124–125).

However you treat hyperglycemia, checking your blood glucose frequently will tell you if it is returning to within its recommended range. If your blood glucose falls due to increasing your dosage of insulin or other medication, you may need to reduce the dosage when your blood glucose has returned to the recommended range. If you cannot discover the cause of your hyperglycemia or are unsure about how to treat it, talk with your health professional.

POSSIBLE SYMPTOMS OF HYPERGLYCEMIA



Possible risks of hyperglycemia

Brief episodes of hyperglycemia are unlikely to be harmful, but a consistently high or rising blood glucose level (often due to illness, see pp.124–125) may

produce uncomfortable symptoms and may lead to diabetic ketoacidosis (DKA) if you have type 1 diabetes or hyperosmolar hyperglycemic state (HHS) if you have type 2 diabetes. Both of these conditions need emergency medical treatment. In the long-term, a persistently raised blood glucose level increases your risk of developing diabetes-related complications (see pp.180–201).

Diabetic ketoacidosis (DKA)

If you have type 1 diabetes and there is no insulin in your body, your body cells cannot take in glucose and break down fat as an alternative source of energy. During this breakdown, toxic by-products called ketones are produced, which, in addition to extreme thirst and frequent passing of urine, can cause serious symptoms, including:

- Nausea and vomiting.
- Abdominal pain.
- Fruity smelling breath and impaired consciousness in the later stages.

Without prompt medical treatment, DKA can lead to a life-threatening coma.

If you have any symptoms of DKA, check your blood glucose level. If it is above 200 mg/dl, you should also check your urine ketone level with urine ketone test strips.

Hyperosmolar hyperglycemic state (HHS)

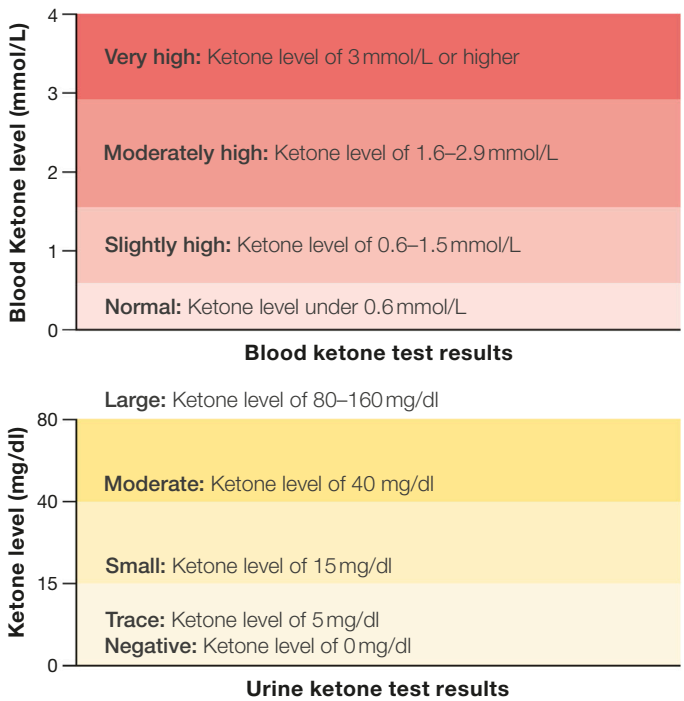
If you have type 2 diabetes, you are less likely to develop DKA because you may still produce some insulin. The presence of some insulin means that your body cells still have access to glucose and do not need to break down fat for energy, so they do not produce ketones. However, severe hyperglycemia can lead to a serious condition known as hyperosmolar hyperglycemic state (HHS), with symptoms that may include:

- Dehydration and dry skin.
- Thirst.
- Frequent passing of urine.
- Nausea.
- Confusion and disorientation; if severe, HHS may cause loss of consciousness.

Without prompt medical treatment, HHS can lead to extreme dehydration and coma, and can be life-threatening.

CHECKING KETONES

You can check for ketones either in your urine or your blood. Urine testing requires strips that you dip into a urine sample; the strip changes color, and the color is compared against a chart to give a ketone reading. Blood ketones may be checked in the same way as blood glucose, using a fingerstick blood sample, test strips, and a meter. Some blood glucose meters are also able to measure ketones; alternatively, a dedicated ketone meter may be used.



Eating, drinking, and being active

Healthy eating

Food and diabetes

Carbohydrates and fiber

Fats, proteins, vitamins, and minerals

Beverages

Cooking and eating out

Weight and diabetes

How to lose weight

Physical activity

Being more active

Activity and blood glucose

Healthy eating

The basic principles of healthy eating if you have diabetes are no different than those for anyone else. However, it's good to be familiar with the main food groups and how to balance your food intake to be as healthy as possible. Eating healthfully is one of the key factors in reducing the risk of heart disease and other complications.

The importance of healthy eating

There are some basic principles underlying good nutrition and a healthy diet, and these are helpful to follow no matter what type of diabetes you have. Understanding food groups (see panel, opposite) is useful and more information about these groups is given on the following pages.

By following some general healthy eating tips (see below), you can adopt good habits that will help keep your cholesterol and blood glucose levels within a healthy range and help to reduce the risk of diabetes complications.

HEALTHY EATING TIPS

- Limit the amount of added sugars and sugary foods you consume.
- Watch out for hidden sugars, especially in fruit drinks.
- Eat regular meals that contain fewer processed carbohydrates.
- Choose quality carbohydrates such as brown rice, chickpeas, lentils, and vegetables.
- Cut down on fat, especially saturated fats.
- Eat more high-fiber foods, including fruit and vegetables.
- Try to have homemade meals rather than prepared meals several times a week.
- Reduce processed meat in your everyday eating.
- Reduce your salt intake to help prevent high blood pressure.
- Keep your alcohol consumption within the recommended limits.

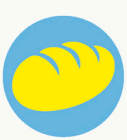
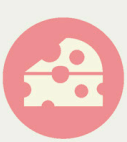
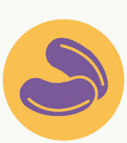
◁ **Food choices**
Making healthy choices in what you eat will help you manage your diabetes and keep you well in the long term.

A balanced eating pattern

You can achieve a balanced eating pattern by choosing a variety of foods from each of the main food groups (see below). There are no strict recommendations about the proportion of each, but there are general guidelines. A healthy diabetes plate contains ¼ whole grains or starchy vegetables, ¼ lean meat or legumes, and ½ nonstarchy vegetables. Protein-rich foods, such as eggs, legumes, fish, or lean meat, should form a smaller part of each meal. Choose at least five servings per day of fruits and vegetables. A serving is generally ½ cup cooked or 1 cup raw vegetables, and ½ cup canned or 1 medium piece of fresh fruit—an apple, or 1/2 cup cooked green beans, for example). Fruit and vegetables are low in calories and rich in vitamins and minerals, although fruit does contain some natural sugar. Sugar, salt, and saturated fat are ideally eaten in small amounts.

FOOD GROUPS

There are five main food groups—fruits, vegetables, grains, meat, and dairy—and consist of the macronutrients carbohydrate, fat, and protein. Individual foods may contain more than one of these food groups.

CATEGORY	ROLE AND MAIN SOURCES
 **Carbohydrate**	Carbohydrates are used by the body for energy. They fall into two types: sugars and starches. Whole grains and legumes are quality starch choices and may be slower to digest, helping you to feel full longer. Sugars include table sugar, honey, syrup, and brown sugar, as well as other added sugars. See also pp.78–83.
 **Fat**	Fat is an important component of many body cells and plays a key role in growth and development. There are different types: saturated and unsaturated. Unsaturated fat is healthiest. Fat is found in oils, butter, and spreads, as well as in red meat, fish, dairy produce and eggs, and in nuts and seeds. See also p.84.
 **Protein**	Your body needs protein to create, maintain, and repair its cells. The main sources of protein are meat, fish, beans and other legumes, nuts, eggs, and dairy products. See also p.85.

Food and diabetes

Learning about how some foods can affect your diabetes and developing a knowledge of what meals and snacks work best for you are key when you have diabetes. If you take insulin or insulin-stimulating pills, you need to be aware of how food interacts with insulin. If you are overweight, then paying attention to your food intake is important if you are trying to lose weight.

Type 1 diabetes

If you have type 1 diabetes, matching your food intake to the action of your insulin is the way to maintain a healthy blood glucose level. For example, if you take a shorter-acting insulin, you will need to take it around the time that you are having your meals. You will also be taking a longer-acting insulin, and you may need to eat extra snacks to make sure that there is glucose available in your body when your insulin is working at its peak. The exact timing of your food and insulin together will depend on the type of insulin you take (see pp.44–45).

PLANNING FOOD INTAKE

Set aside some time each week to plan your food intake.

- If you think you won't be able to get something to eat when your pills or insulin are working, pack a snack to take with you.
- Spread out your carbohydrate intake throughout the day; having one very large meal usually will cause your blood glucose level to climb too high.
- If you choose to eat a sugary snack, eat it in small amounts or on days when you are more active, to reduce the impact on your blood glucose level.

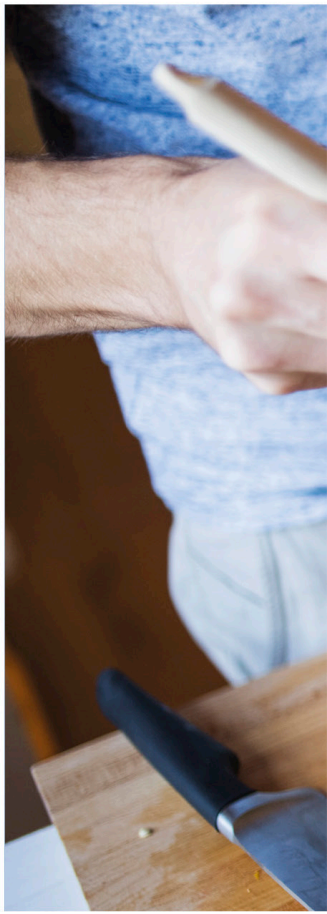
Type 2 diabetes

With type 2 diabetes, your body's ability to produce insulin effectively when you eat is impaired, so eating foods that take longer to be broken down into glucose may help your pancreas to cope. Sugary foods are converted into glucose the fastest, so eating them when your blood glucose is already high will make it rise even higher than when you eat them when your blood glucose is in target range. Eating less carbohydrate-rich food at one time helps to reduce the pressure on your pancreas.

If you are taking pills for your diabetes, you will need to take them in relation to your meals, because some work by helping your body to break down food more slowly, whereas others make your pancreas produce more insulin (see p.59). If you are taking insulin for your type 2 diabetes, you need to be aware of its peak of action (see p.45) so you can time eating to prevent low blood glucose.

If you are overweight, you may also need to change your food intake in order to lose weight (see pp.94–99).

If your eating pattern is irregular or disrupted, your blood glucose level may also be erratic



△ **Fresh produce** *Making your own meals with lots of fresh produce is a good option for diabetes management. Salads are a great way to fill up without contributing to weight gain. Get inspiration for recipes from books or online resources.*

Timing of meals and snacks

An important part of living with diabetes is recognizing when you need to eat or drink in order to balance the effects of pills or insulin on your blood glucose. Regularly eating meals that contain complex carbohydrates will fuel your body, help your digestive system to function properly, and avoid sharp changes in your blood glucose level.

Having diabetes doesn't mean you need to eat more snacks, but they may be helpful if you use insulin or insulin-stimulating pills and you need to avoid becoming hypoglycemic. Try to make sure that snacks aren't high in fat or sugar.

SNACKS UNDER 100 CALORIES

20 grapes	1 oz. salted or plain popcorn
6 oz. mango	1 large apple
1 oz. dried fruit and nuts	2 small oranges
4 bread sticks	1 medium banana

Carbohydrates and fiber

Carbohydrates are an essential energy source for the body, but they can have a significant effect on blood glucose levels. Fiber can also affect blood glucose levels, because it has an impact on how quickly carbohydrates are absorbed.

Types of carbohydrates

Carbohydrates are found in many foods such as bread, candy, milk, pasta, fruit, and cake. The most common forms of carbohydrates are sugars, starches, and fiber. Quality carbohydrate foods are part of a healthy eating pattern.

Sugars

Sugars are a type of carbohydrate. Common sugars are sucrose, fructose, lactose, and glucose. Because sugars are broken down and absorbed quickly, they are the best option to treat hypoglycemia (see pp.66–67).

Sugar occurs naturally in food such as honey, milk, and fruit. They are also added to products such as regular sodas, cakes, cookies, and even breakfast cereals. While small amounts of added sugars aren't harmful, it is recommended to limit them for overall health as well as for blood glucose management.

Starches

Starchy foods such as rice, pasta, potatoes, and sweet potatoes, also contain carbohydrates. Like sugars, they are also broken down into glucose in your body. Refined (processed) carbohydrates—found in foods like white bread, white rice, and pasta, have had the bran (fiber) and kernel of the grain removed, leaving just the starchy part. These are digested faster than unprocessed grains, and may raise blood glucose levels almost as quickly as sugars. Less processed foods, such as whole wheat bread, whole grain pasta, and dried beans, are quality carbohydrates which are better for your health and blood glucose management.

Carbohydrates have a significant effect on blood glucose levels

ARTIFICIAL SWEETENERS

You can use artificial sweeteners instead of sugar to sweeten food and drinks such as tea and coffee. These products contain aspartame, saccharin, stevia, acesulfame K, neotame, monk fruit, advantame, or sucralose, none of which affect your blood glucose. These products are classed as food additives and have been tested for safety. Allulose is a low-calorie sweetener that has 90% fewer calories than sugar. If you would like to bake with artificial sweeteners, check the label to make sure it can hold up in high temperatures.

SUGARS

Sugars are rapidly absorbed and can affect your blood glucose quickly. That is why they are useful to treat hypoglycemia caused by too much insulin.

Sugar: all types, including maltose, sucrose, cane syrup, and brown sugar.

Honey and syrups, including corn syrup, and agave nectar.

Jams: most contain more than 60% sugar; some low-sugar jams may contain less.

Sweets and chocolate have varying, but generally large, amounts of added sugar.

Sugary drinks, including smoothies and fizzy drinks, contain high levels of sugar.

Cakes, cookies, and desserts often contain a high proportion of sugar.

Fruits contain the fruit sugar fructose. Whole fruits should be included in a healthy diabetes meal plan.

Milk and yogurt: milk contains 5% lactose; look for added sugars in milk or yogurt.

Fruit juice Choose whole fruits instead of fruit juice.

STARCHES

These are broken down in the digestive system into glucose, but less processed forms may be digested more slowly, and have less risk of a dramatic rise in blood glucose.

Bread: whole grain varieties may be digested more slowly than refined breads and are a better choice for your health.

Rice: brown and wild rice are whole grains, which are a healthier option than white rice.

Pasta and couscous are both wheat-based products. Choosing whole wheat pasta is a healthy option.

Noodles: wheat and egg noodles are not usuallya source of whole grains.

Potatoes, plantains, sweet potatoes, and yams are considered starchy vegetables.

Oats: eaten as oatmeal or used in other products, oats are also high in soluble fiber (see p.83).

Beans (including navy, cannellini, and kidney beans) contain fiber as well as carbohydrates. This slows digestion.

Lentils: these are good sources of protein as well as carbohydrates.

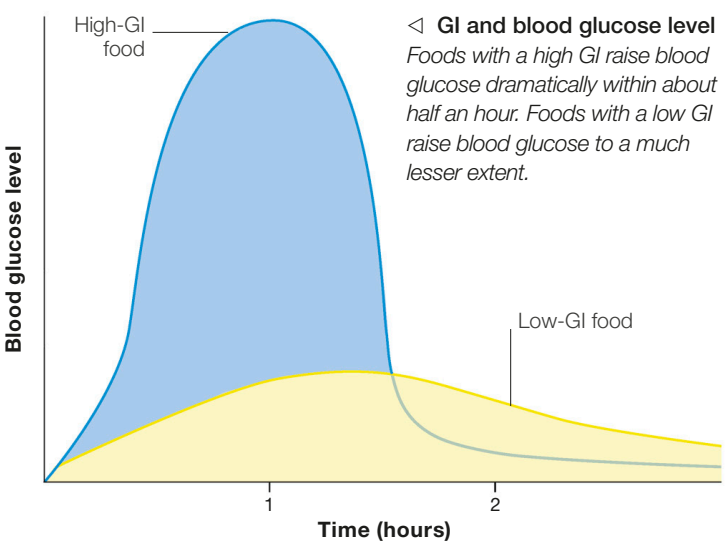
Bulgur wheat and quinoa: bulgur and quinoa (a nutrient-rich seed eaten like a grain) are good sources of whole grains.

Managing your carbohydrate intake

Carbohydrates have a significant impact on your blood glucose level, so you need to be aware of the carbohydrate content of what you eat. Being aware of your intake can help you manage your diabetes, Monitoring your carbohydrate intake and spreading it throughout the day helps you to keep your blood glucose in your target range.

Carbohydrate counting (see p.82) is an important method for matching the amount of insulin you need to take. While carbohydrate content will have the most effect on your blood glucose, considering the glycemic index (GI) of food may be useful for fine-tuning your blood glucose levels.

Low GI foods are not always a healthy choice. Chocolate, for example, is high in fat and sugar



◁ **GI and blood glucose level**
Foods with a high GI raise blood glucose dramatically within about half an hour. Foods with a low GI raise blood glucose to a much lesser extent.

△ **Reducing overall GI**
The GI applies to a specific food eaten on its own. Eating a low GI food together with a high one averages the overall GI.

Understanding glycemic index (GI)

The GI is a ranking of carbohydrate-containing foods based on their effect on blood glucose levels. Foods that are digested slowly have a low GI rating; quickly digested foods have a high rating (see chart opposite). Eating more low- and medium-GI foods may help you balance your blood glucose level.

Higher-GI foods tend to be those that are higher in refined sugar. These foods can cause spikes in your blood glucose level. On the other hand, not all lower-GI foods are healthy options. For example, a pancake made with low-GI oats still contains a lot of sugar and fat; chocolate has a low GI because the fat slows its absorption.

The GI applies to an individual food; when foods of differing GIs are mixed, high-GI foods are absorbed more slowly than when eaten on their own. Cooking methods and ripeness can also affect the GI of a food.

GLYCEMIC INDEX

Foods are given a GI number between 1 and 100, with glucose (sugar) scoring 100 because it causes blood glucose to rise very quickly.

Each food has a GI rating, and different brands of the same food can vary. The following foods are examples of each category.

HIGHER-GI FOODS (OVER 70)	LOWER-GI FOODS (UNDER 55)
Mashed potatoes	White pasta
Honey	Sweet potatoes
Popcorn	Brown rice
Potato chips	Basmati rice
Watermelons	Rye bread
Noodles	Peas
Full-sugar cola	Kidney beans
MEDIUM-GI FOODS (55–69)	Yogurt
Raisins	Dried apricots
Brown bread	Chickpeas
Boiled potatoes (with skin)	Lentils
Melons	Dark chocolate (70% cocoa)
Bananas	Red peppers
Couscous	Onions
White rice	Eggplant

MAKING GI WORK FOR YOU

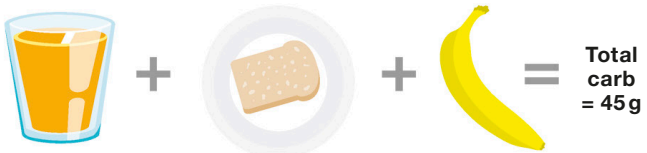
- When planning meals, figure out whether most of the meal is higher GI or lower GI, so that you can predict its effect on your blood glucose.
- Remember that if you eat only very low-GI foods you may need to reduce your insulin or medication dose in order to avoid unexpected hypoglycemia.
- Experiment with different foods to find their GI effect, by checking your blood glucose after eating them.
- Eating a higher-GI food together with a lower-GI one may help to blunt the quick rise in blood glucose from the higher GI food.

Carbohydrate counting

You can use carbohydrate counting to help you calculate how much insulin you need to take to cover a meal. This will help you to prevent a blood glucose spike. This technique is especially important if you are using rapid-acting insulins and gives you more freedom about what you eat. First, identify the foods that don't contain carbohydrates (for example, lean meat, and cheese) as they don't need to be counted. Then determine the total carbohydrate content of each of the individual carbohydrate-containing foods. Finally, use your personal insulin:carbohydrate ratio (see p.49) to calculate your insulin dose. For example, if you need 1 unit of insulin per 10 g carbohydrate, you will need 4.5 units for a meal that has 45 g of carbohydrates.

HOW TO COUNT CARBOHYDRATES

By adding up the carbohydrates in each food, you can find the total amount for each meal. This will enable you to calculate how much bolus insulin you need, using your insulin:carbohydrate ratio.



4 oz. orange juice = 15 g carb

1 slice of toast = 15 g carb

1 small banana = 15 g carb

Carbohydrate-counting tools

Various tools are available to help you count your carbohydrate intake. You can refer to carbohydrate reference tables (available as booklets and online) or food labels (see p.96). There are also apps that can calculate the amount of carbohydrates for you.

UNDERSTANDING CARBOHYDRATE CONTENT

The more carbohydrates your food contains, the more insulin you need to convert it into energy. Carbohydrate content always stays the same, regardless of how it is cooked—although the food will weigh more if it absorbs water during cooking. Always try to count the carbohydrate content of raw food rather than cooked.

AMOUNT	EXAMPLES OF FOODS
10 g carbohydrate	1 thin slice bread; 2 cups of popcorn; 6 tortilla chips; 1 hard taco shell; 1 tablespoon rice (uncooked); 2 tablespoons beans; 1 small apple; 1 medium plum.
15 g carbohydrate	1 medium slice bread; ½ cup mashed potatoes; ½ English muffin; ⅓ cup cooked rice or pasta; 1 small banana; ¾ cup blueberries; 8 oz. milk.
20 g carbohydrate	1 thick slice bread; 1 small (4" diameter) pita bread; ½ cup cooked rice or pasta; 1 medium mango or apple; 2 tablespoons raisins; 6 jelly beans.
30 g carbohydrate	½ bagel; 1 English muffin; 1hamburger or hot dog bun; 1 whole wheat tortilla; 1 cup bran cereal; 2 tablespoons lentils (uncooked); 1 cup grapes; 14 gummy bears.

Fiber

There are two types of dietary fiber, both of which are important to your health. Insoluble fiber helps food to pass through your digestive system, thus keeping your intestines healthy and reducing the risk of constipation. Soluble fiber slows the digestion of carbohydrates and stops your blood glucose level from rising too quickly after eating. Soluble fiber also helps to reduce your cholesterol level. Many fiber-rich foods contain both types of fiber, but one type tends to dominate.

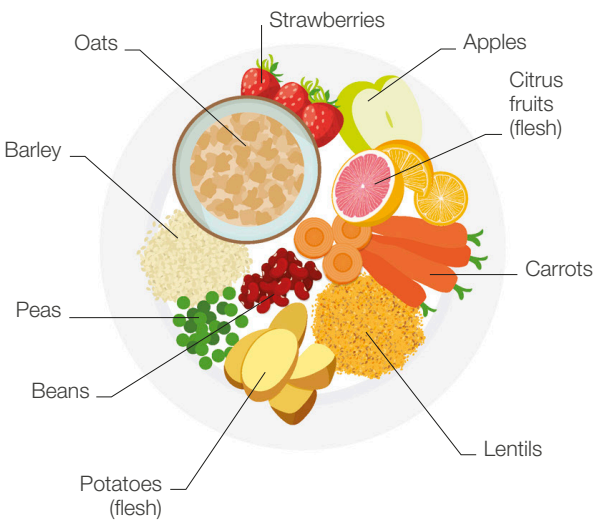
Adults should aim to eat about 30 g of fiber a day. If you need to increase your fiber intake, do so gradually, and drink plenty of fluids with the food.

Fruit and vegetables

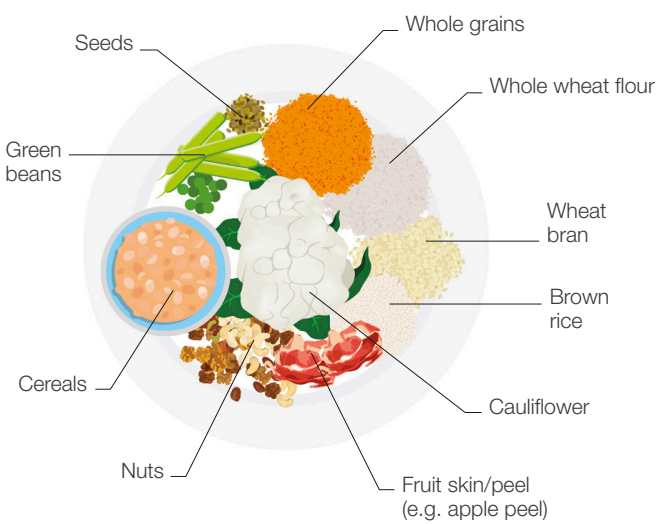
As well as being low in calories and rich in vitamins and minerals, fruit and vegetables are excellent sources of fiber. Including the skin of fruit and vegetables—such as apple peel and potato skins—will help to increase your fiber intake. Space out your consumption of fruit and vegetables through the day to get the nutritional benefits without raising your blood glucose level too much.

HOW TO ADD MORE FIBER TO YOUR DIET

- Add extra fruit, seeds, or nuts to breakfast cereals and yogurts.
- Add beans or lentils to dishes such as stews and soups. This will also reduce the meat and fat content of these meals.
- Include plenty of vegetables with meals.
- Keep chopped raw vegetables, such as carrots, celery, and cherry tomatoes, prepared in the refrigerator for snacks.
- Choose unprocessed grains, such as whole grain pasta and brown rice.



△ **Good sources of soluble fiber**
Many foods that are high in soluble fiber are useful as snacks on their own or can be added to mealtime dishes to make them healthier and stretch further.



△ **Good sources of insoluble fiber**
Foods that are high in insoluble fiber tend to increase the feeling of fullness, helping to prevent you from feeling hungry between meals. They can also aid in preventing constipation.

Fats, proteins, vitamins, and minerals

Fats and proteins are important components of any eating plan. Although they have a limited effect on blood sugar, fats are high in calories. Understanding which protein foods are the best option and choosing foods with healthy fats is important for anyone with diabetes.

HOW TO CUT DOWN ON FAT

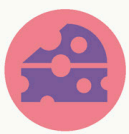
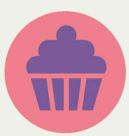
- Replace butter or full-fat margarines with lower-fat spreads, particularly products that contain monounsaturated fats.
- Use low-fat sour cream, Greek yogurt, or low-fat cream cheese.
- Eat more fish, including two portions of fish a week.
- Choose lean cuts of meat and skinless poultry.
- Choose fried foods less often.

Fat in your diet

Fats are found in dairy products such as milk, butter, and cheese, cooking oils, meats, and nuts, as well as in processed foods. Healthy fats have little effect on blood glucose. However, saturated fats have a negative effect on glucose levels. Eating too much fat is linked to high blood levels of fat (hyperlipidemia), heart and circulatory disease, and stroke, all of which are possible complications of diabetes (see pp.192–197). Being overweight can also contribute to the risk of developing these complications, and fats are very high in calories. Regular dairy products are high in fat, they also contain carbohydrates and proteins and are a source of calcium and vitamins.

To help protect against heart and circulatory conditions, and also to help if you are trying to lose weight, choose lower-fat versions of fatty foods, for example, 1% or nonfat milk, low-fat or fat-free yogurt, or reduced-fat cheese.

TYPES OF FATS

HEALTHIER FATS		LESS HEALTHY FATS	
 **Monounsaturated fats**	Monounsaturated fats are found in some margarines and cooking oils, including olive oil and canola oil. They are also in nuts, seeds, and avocados. These fats do not raise levels of LDL ("bad") cholesterol and are a healthier alternative to saturated fats.	 **Saturated fats**	Saturated fats are mainly found in animal products—butter, cheese, and the fat around a piece of steak are examples—but they are also found in coconut and palm oils. These fats raise blood levels of LDL ("bad") cholesterol.
 **Polyunsaturated fats**	There are two groups of polyunsaturated fatty acids: omega-3 and omega-6. Omega-3 is found in fish, canola oil, and walnuts. Omega-6 is found in sunflower, safflower, and corn oils. They are healthier than saturated fats.	 **Trans fats**	Trans fats raise LDL ("bad") cholesterol and lower HDL ("good") cholesterol, increasing the risk for heart disease. Trans fat is included on food labels. Choose foods with 0 grams trans fat.

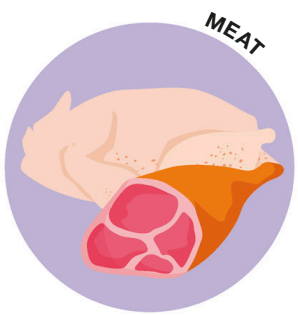
Proteins

Protein is a vital nutrient: your body needs it to create, maintain, and repair its cells, and to keep your muscles healthy. It's important to get enough protein, but not too much. Most people need about 1 g of protein per kilogram of your body weight—for example, if you weigh 80 kg, you need 80 g protein per day. Protein has little effect on your blood glucose level, but when you are choosing which type to eat, you can make healthier choices—for example, by cutting down on red meat, eating reduced-fat cheese, and including fish in your meal two to three times a week. Milk, cheese, and yogurt also have lots of calcium as well as protein. If you enjoy eggs, have them scrambled (without using butter), poached, or boiled to avoid consuming extra fat.

Vitamins and minerals

A healthy, balanced food intake provides all the vitamins and minerals you need. Whether you have diabetes or not, you do not need to take vitamin or mineral supplements unless your health professional advises it. Supplements may be recommended if your food intake is restricted in any way. Fruit and vegetables are excellent sources of vitamins, minerals, and fiber; aim for at least 3 servings of vegetables and 2 servings of fruits per day.

▽ **Protein sources**
The main sources of protein in food are meat, fish, eggs and dairy, and beans and legumes. Some of these are high in fat so should be eaten in limited amounts.



Although high in protein, some meat is high in fat. Poultry is a low-fat choice.

Fish are a low-fat protein source and contain omega-3 fatty acids.

Eggs, cheese, and milk are good protein sources but also contain fats.

Beans and legumes are low in fat and high in fiber as well as protein.

SALT

Having diabetes increases your risk of developing high blood pressure and other circulatory conditions, and eating too much salt also increases this risk. If you have been diagnosed with high blood pressure, you need to limit your sodium intake. Most people should aim for 2,300 mg of sodium per day or less (the equivalent of one teaspoon of salt). Your healthcare provider may recommend a lower amount. Read food labels for the amount of sodium in the foods you eat. Hidden sources of salt include processed foods such as lunchmeat, canned soups, pizza, and baked goods.

Beverages

As well as the food you eat each day, things you drink can affect your blood glucose and you need to keep track of how much of these you consume. Many sweet, fizzy drinks and alcoholic drinks are high in sugar and calories.

Non-alcoholic drinks

You can safely drink tea, herbal tea, black coffee, and water without affecting your diabetes. These will help keep you hydrated. By limiting the amount of milk you put in teas and coffees, and drinking them with fat-free or low-fat milk, you will cut down on calories. If you don't like water, you can try adding lemon or mint to it, to add some flavor, or drink herbal tea.

Some drinks have hidden calories and sugar, so try to keep your enjoyment of these to a minimum. Sugary, fizzy drinks can significantly raise your blood glucose; switching to sugar-free varieties will help. Fruit juices and smoothies may not contain added sugar, but they do contain natural fruit sugars, which can also affect your blood glucose level; these can be diluted easily with water.

◁ **Socializing with a drink**
Keep track of what you drink when you go out. High-sugar drinks or adding sugar to drinks can cause a spike in your blood glucose levels.

DRINKING ALCOHOL SAFELY

Take the following steps to help reduce the impact of alcohol:

- Eat a carbohydrate-containing meal before you start drinking.
- If you can't eat before you have a drink, make sure you have snacks that contain carbohydrates, such as a granola bar or crackers, while you are drinking.
- Carry glucose tablets with you, in case you have low blood glucose. Having ID is also useful.
- If you're driving, don't drink any alcohol at all.
- If you have more than a few alcoholic drinks in the evening, always have a snack before going to sleep.

GET EMERGENCY MEDICAL HELP

- Drinking too much alcohol can cause low blood glucose, which may be mistaken for drunkenness and can be severe. If a person has been drinking alcohol and you think they are experiencing a low blood glucose reaction, call 911.

Alcohol

There's no reason why you shouldn't drink alcohol when you have diabetes. But you need to be aware of its potential impact (see below), and drink within recommended limits. The American Diabetes Association recommends no more than 1 drink per day for women and 2 drinks per day for men.

Alcohol raises your blood glucose level initially, but in larger quantities it prevents your liver from releasing glucose from its stores, lowering blood glucose and making hypoglycemia last longer and be more severe; this may be serious and happen while you're asleep. You can reduce the risk of low blood glucose by eating a carbohydrate-containing meal before or while you are drinking, or by keeping snacks on hand, particularly if you have more than 2 servings of alcohol. You may need to take a smaller dose of insulin or insulin-stimulating pills on a day you think you might be drinking. It is better to have a slightly higher blood glucose level for a short time than suffer severe hypoglycemia that might need hospital treatment.

TYPES OF ALCOHOLIC DRINKS AND EFFECT ON BLOOD GLUCOSE

Alcohol contains simple carbohydrate (sugar), so drinking will initially raise your blood glucose level—the higher the alcohol content, the greater the effect. Many alcoholic drinks are high in calories and carbohydrate content. The alcohol percentage varies, so check the alcohol content given on labels of beers and wines.

DRINK	CALS	CARBOHYDRATE	ALCOHOL CONTENT PER DRINK	EFFECT ON BLOOD GLUCOSE
Beer (12 oz.)	105–140	9–14 g	4.5%	Light beer may have less of an effect on your blood glucose because it is lower in carbohydrates.
Lager (12 oz.)	130–175	12 g	3.2–5%	Low-carb lagers will not raise your blood glucose but can be high in alcohol.
Dry white wine (small glass, 4 oz.)	80–90	0.7 g	9–14.5%	Dry and sweet wines contain similar amounts of alcohol but dry wine may have less of an effect on your blood glucose level because it contains less sugar.
Sweet white wine (small glass, 4 oz.)	110–120	7.5 g	9–14.5%	
Red wine (small glass, 4 oz.)	110–120	0.4 g	9–14.5%	Red wine contains fewer carbohydrates than white wine but the effect on your blood glucose level is similar.
Spirits (single measure, 1 oz.)	50	Trace	40–60%	All spirits have similar amounts of alcohol and calories. On their own, they do not greatly raise your blood glucose level.
Dry sherry (1 oz.)	58	Trace	15.5–20%	Dry sherries have less of an effect on your blood glucose than sweet varieties.
Sweet sherry (1 oz.)	68	3.5 g	15.5–20%	

△ **Healthy recipes** *Incorporating lots of vegetables into your cooking, for example in a stir-fry, is a simple step to healthy eating.*

Cooking and eating out

Having diabetes doesn't mean that you have to miss out on your favorite recipes. Instead, you can adapt them to reduce your fat, salt, and sugar consumption, include more fruit and vegetables, and make your meals healthy and well-balanced. Even for special events, such as a party, dining out, or a festive occasion, you can make choices that enable you to enjoy your food and still stay well.

Healthier cooking

To limit your fat intake, try to grill, steam, or bake foods rather than fry them. If a recipe does require frying, use cooking oil (see p.84 for healthier types) instead of butter. If roasting meat, place it on a rack to let the fat drain away. Adding herbs helps you to bring out the flavor in food, and use less salt. You don't have to leave out every high-fat or high-sugar food, however, especially if a little of that ingredient goes a long way. Parmesan cheese, for example, is high in fat but has a very strong flavor—you only need to use a sprinkling. Honey, too, is high in sugar, but a small amount can sweeten a dish more effectively than a lot of sugar. So if a recipe calls for small amounts of high-fat or high-sugar ingredients, go ahead and use them.

Events and celebrations

With planning, you can fit your diabetes care in to any celebratory event. First, find out the timings when food will be served; then you can work out (with help from your health professional if you need it) the timings of your insulin and/or pills and monitoring to match. For example, for a late-afternoon wedding with a sit-down meal, you may need to take your evening medication a little later than usual, while for a lunchtime celebration, you may need extra blood glucose checks and to be prepared with your own snacks in case of a delay in eating. You may also need an extra dose of pills or insulin in advance, if you know you'll be eating a lot.

Some religious events involve fasting and then eating at set times. Although having diabetes can exempt you, if you still want to fast you can manage by having lower doses of your diabetes medication before fasting and changing the time for doses after the fast, while also monitoring your blood glucose regularly. Drink plenty of sugar-free fluids, including during the fast if possible, to avoid dehydration.

Dancing, drinking alcohol, or delays in eating can all make hypoglycemia more likely (see pp.62–67). To prevent hypoglycemia or to stop it from becoming more severe, it is important for you to carry fast-acting carbohydrates and to be alert for any symptoms.

With planning, you can fit your diabetes care in to any celebratory event

△ **Festivities and food**
Celebrations often have lots of tempting foods you want to try. Plan in advance how to manage your diabetes so that your blood glucose stays in your target range, even if you eat more than usual.

RECIPE ADJUSTMENTS

There are low-fat, low-sugar substitutes for many ingredients. There are also cooking methods that reduce calories without compromising flavor.

- Use more vegetables in soups and stews to increase fiber and reduce fat content. Instead of adding cream, add a little low-fat yogurt at the end of cooking.
- Use low-fat half-and-half instead of cream (for example, in home-made ice cream).
- Use strongly flavored cheese in recipes, such as parmesan, goat cheese, or feta, so that you don't need to use as much.
- If using a fatty meat, dry-fry it first and drain off the excess fat before continuing with the recipe.
- Use tomato-based sauces for pasta dishes rather than creamy sauces.
- If using pastry, just use a thin single layer (for example, with a pie) or top your dish with phyllo dough instead of a regular crust.
- Cut down the amount of salt you use; replace it with herbs, spices, or lemon juice to add flavor.
- Use fat-free greek yogurt and reduced-fat cream cheese in equal amounts instead of eggs and mascarpone cheese to make tiramisu. You can still add a small amount of sugar.
- Cut down the amount of sugar in pudding recipes or substitute artificial sweeteners (check the packet for when to add these).

Eating out

You don't need to deny yourself the pleasure of eating out, especially if you do so only occasionally. One way to allow for extra food and drink is to adjust your medication to allow for a rise in your blood glucose level if necessary. Even if you don't, the rise will be brief and your blood glucose level will lower again once you return to your usual eating pattern.

The timing of a meal out may differ from your normal mealtimes. This means you may need to change the time of your pills or insulin injection to coordinate your dose with your food intake. You may not be able to predict exactly when you will be eating, but you can alter the usual timing by about two hours without it affecting your overall blood glucose level. If you delay your medication, however, it may continue working later than normal as a result. Take a snack with you or plan what to do in case the service is slow, to avoid hypoglycemia while you are waiting.

Choosing from the menu

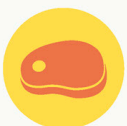
If you are determined to keep to healthy eating, the following ideas may help:

- **Fats** Avoid dishes that are deep-fried or drenched in sauce or oil.
- **Meat** If possible, ask for extra vegetables and a little less meat.
- **Sauces** Order sauces and dressings on the side to control the amount.
- **Fruit and vegetables** Opt for fruit- or vegetable-based dishes, or ask for extra amounts.
- **Drinks** Have low-calorie drinks or water rather than, or together with, alcohol or fruit juice.

▽ **Asking for advice** *When choosing what to eat, check with your server for more information on ingredients in your chosen dishes.*

HEALTHY MENU OPTIONS

Every restaurant menu should have options that fit into a healthy-eating plan. On the whole, vegetable-based dishes are healthier than meat dishes, and fruit-based desserts are better than those with a lot of cream, sugar, or pastry. You also need to consider what foods accompany your dish, so that your meal is balanced. Ask the restaurant staff for advice if you need more information about portion size, ingredients, or cooking methods. It is especially important to bear healthy menu options in mind if you eat out regularly. The table below gives examples of healthy and less healthy choices for each type of dish.

	HEALTHY CHOICES	LESS HEALTHY CHOICES
 **Meat dishes**	Steak without sauce; roast chicken (skin removed); grilled lamb (fat removed); stir-fried pork with vegetables; kebabs (no sauce); tikka or tandoori meats	Beef stroganoff; shepherd's pie; steak in creamy sauce; fried lamb chops; burger in a bun; curries with creamy sauces (such as korma)
 **Fish dishes**	Baked or poached salmon or tuna; grilled swordfish steak; smoked mackerel fillets; sashimi or sushi rolls with no rice	Fish in batter; deep-fried scampi; fish in creamy sauce; fish in cheese-based sauce; "California roll" sushi pieces; tempura dishes
 **Pasta and noodle dishes**	Pasta with vegetable or tomato sauce; spaghetti Bolognese; pasta with tuna or smoked mackerel; seafood pasta; stir-fried vegetables and rice noodles; Udon noodle soup	Pasta with creamy sauce, such as carbonara; beef lasagna; pasta with cheese sauce; noodles with sweet and sour sauce
 **Vegetable dishes**	Vegetable-stuffed peppers; stir-fried vegetables; tofu; vegetable soup; steamed vegetables with rice; ratatouille; vegetable kebabs; baked potatoes	Vegetable pizza; spring rolls; vegetable samosas; vegetable pasty; roast, sautéed, or mashed potatoes cooked in oil or butter; french fries; fried rice
 **Desserts**	Fresh fruit salad; fruit sorbet; small portion of dessert, or one portion shared with a friend	Tiramisu; cheesecake; chocolate mousse; ice cream; sauces based on cream or alcohol

Weight and diabetes

Maintaining a healthy weight is one of the most important steps you can take to manage your diabetes. Being overweight can raise your blood glucose level and cause high blood pressure, increasing your risk of heart and circulatory problems. Where on your body you carry any excess weight is also important.

Why weight matters

Your weight can influence how easy it is to manage your diabetes and can make a difference to the type and dose of any medication you take. Being overweight makes managing your blood glucose level, blood pressure, and cholesterol more difficult and increases the risk of heart disease. Keeping your weight within the ideal range for your height or, if you need to, losing some weight, has many health benefits. To assess whether you are overweight you need to measure your body mass index (BMI), which is a ratio of your weight to your height. To determine your BMI, you can either use a chart (see opposite) or calculate it by dividing your weight in pounds by the square of your height in inches, then multiply by 703. For example, if you weigh 180lb and are 6ft tall, your BMI is 180 ÷ (72 x 72) x 703, which equals 24.4, a figure that puts you in the healthy weight category (BMI 18.5–24.9).

Weight and type 2 diabetes

You are more likely to develop type 2 diabetes if you are overweight, as this can make your cells resistant to insulin. Four of five people with type 2 are overweight. If you are overweight, even losing a small amount will make it easier to manage your blood glucose level, lower your blood pressure and cholesterol, and prevent or delay the onset of future complications, such as heart disease (see pp.192–195). You are also likely to need a lower dose of pills or less insulin. Losing more weight may even help you get off diabetes medication altogether (see pp.22–23).

CAUSES OF WEIGHT GAIN AND WEIGHT LOSS

Weight loss

Common in people with type 1 diabetes when first diagnosed. Starting treatment with insulin will help you to regain lost weight.

May occur gradually with type 2 diabetes if blood glucose levels are consistently high: this means your body is not using glucose properly for energy and instead is using fat from stores in your muscles and beneath your skin.

May be an effect of other conditions, possibly related to your diabetes, that produce weight loss. One such example is an overactive thyroid.

Not taking enough insulin in order to prevent weight gain, developing an eating disorder, or emotional distress.

Weight gain

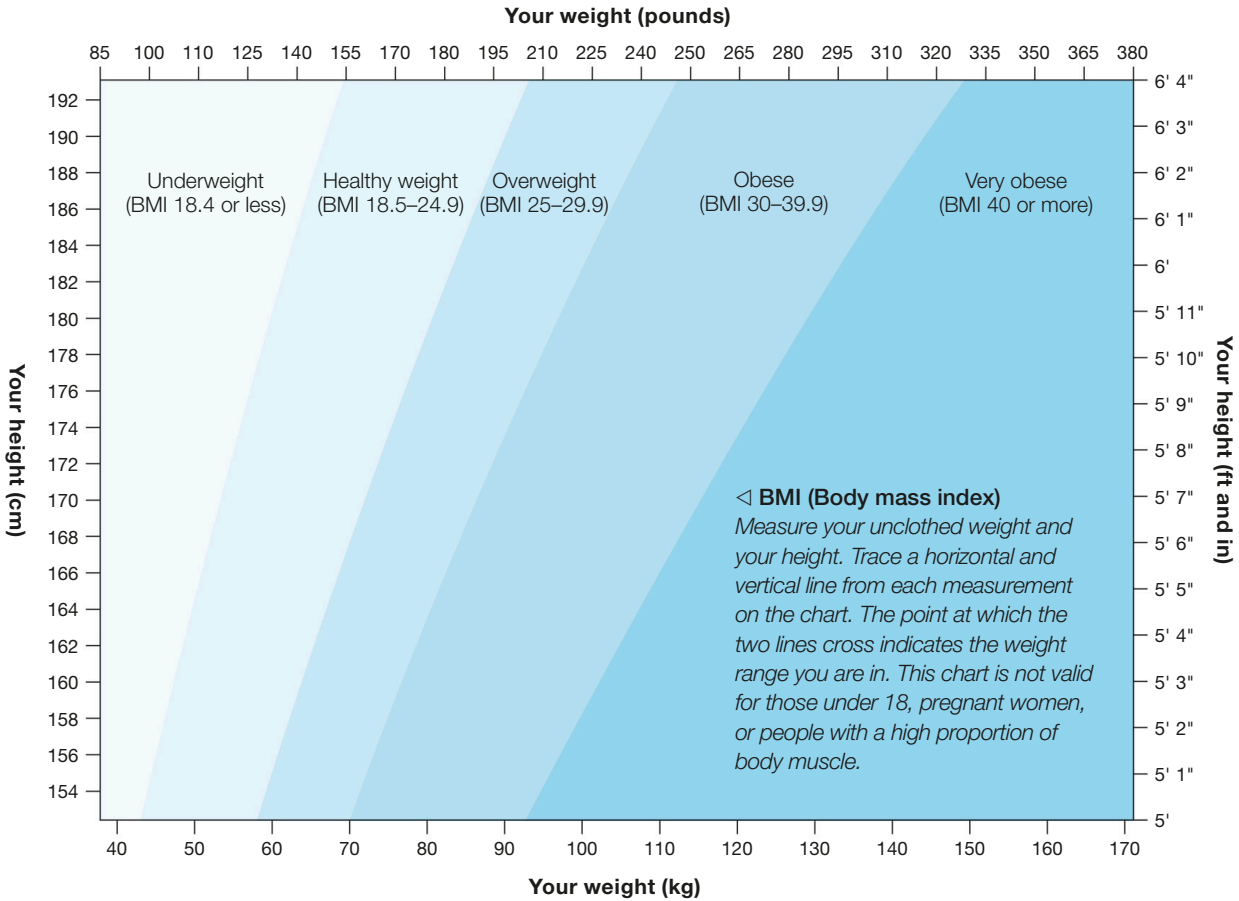
Possible side effect of some pills for type 2 diabetes (see pp.58–59). Discuss possible alternatives with your health professional.

Having extra food to balance insulin-stimulating pills or insulin.

Taking more insulin than you need; insulin causes the body to store glucose as glycogen in your liver and muscles; getting the dose and type of insulin that is right for you can help to avoid weight gain.

Eating too many calories, for a variety of reasons, including emotional eating. Your health professional can help with practical and emotional support, or refer you to a specialist.

Becoming less active because you are physically unable to exercise or find it difficult to fit physical activity into your day.



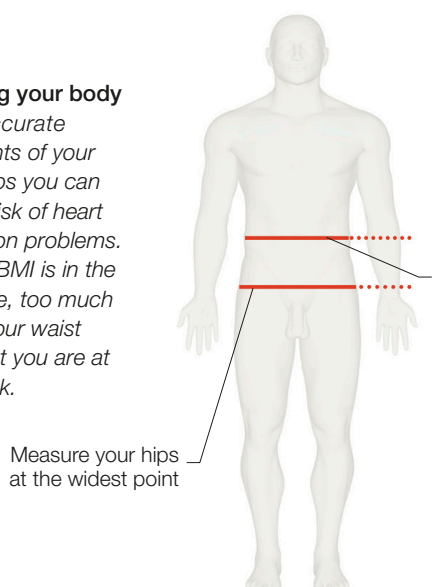
◁ **BMI (Body mass index)**
Measure your unclothed weight and your height. Trace a horizontal and vertical line from each measurement on the chart. The point at which the two lines cross indicates the weight range you are in. This chart is not valid for those under 18, pregnant women, or people with a high proportion of body muscle.

Why body shape matters

Body shape is more important than weight itself in terms of your risk of heart disease. If you carry extra fat around your middle rather than around your hips, you have an increased risk of problems.

- Waist circumference: If your waist is more than 40 in (for a man) or 35 in (for a woman), you are higher risk of heart and circulation problems.
- Waist-to-hip ratio: Divide your waist measurement by your hip measurement. If the result is more than 0.9 (for a man) or more than 0.85 (for a woman) your risk of developing heart disease is higher.

▷ **Measuring your body**
By taking accurate measurements of your waist and hips you can check your risk of heart and circulation problems. Even if your BMI is in the healthy range, too much fat around your waist indicates that you are at increased risk.



How to lose weight

The best approach to losing weight—and the way to keep the weight off—is to eat fewer calories and/or be more active. There are several ways of doing this, including calorie counting, intermittent fasting, and low-carbohydrate eating. For any method, planning ahead and finding support will help to keep you motivated.

First steps

If you are overweight, bringing your weight down into the recommended range for your height (see pp.92–93) will be beneficial: your blood glucose level and blood pressure may come down, your blood cholesterol level may improve, and you may well look and feel better. Once you have lost weight, maintaining it within recommended range will help you to keep healthy.

You are more likely to succeed in losing weight if you set yourself practical targets. For example, aim to lose about 0.5–1lb per week. You may find you lose more weight one week than you do the next. This is normal as your body adjusts to new eating habits. It is important to lose weight gradually: most "quick-fix" diets that produce rapid weight loss are unhealthy, especially if followed long-term, and you are less likely to keep the weight off.

Using a food diary

The first step toward successful weight loss is to look at your eating habits so that you can plan what to do differently. Recording what and when you eat and drink and how you feel can show where you might be taking in excess calories, whether your meals are spread evenly through the day, and whether you are snacking unnecessarily between meals.

When reviewing your food diary, ask yourself the following questions:

- Do I eat high-fat or high-sugar foods at particular times of the day?
- Do I tend to eat in response to my feelings or when I'm bored?
- Do I use ordinary mixers with alcoholic drinks instead of low-calorie versions?
- Do I eat out often and so have less control over what I eat?
- Do I eat very large meals?

If you answered "yes" to any of these questions, you could make changes right away to help you lose weight.

Making an action plan

When you have decided to lose weight, it is useful to come up with an action plan that is realistic and will work for you. In devising a plan, you may find it helpful to consider the following:

- How much weight would I like to lose?

KEEPING YOURSELF MOTIVATED

- Empty your fridge and cupboards of tempting high-calorie foods and replace them with lower-calorie alternatives.
- Keep a record of your successes. Don't focus only on your weight— also include extra activity and how often you have resisted temptation.
- Put encouraging notes or inspirational pictures on your fridge and cupboard doors to remind you what you are aiming for.
- Ask for the support of a friend or family member who will give you encouragement when you need it.

▷ **Checking progress**
When trying to lose weight, weighing yourself regularly will enable you to assess your progress. For accurate results, weigh yourself with the same scales at the same time each day, and wear the same or no clothes every time.

- What specific changes am I going to make to what or when I eat?
- What changes am I going to make to increase my physical activity?
- How will I change my normal routine to fit in these changes?
- How will I find out how much weight I have lost each week?
- How will I motivate myself to achieve my weekly targets?
- Who will I ask to help me stay motivated?
- What will I do on the occasions when I can't do what I have decided?
- When will I start my weight-loss plan?

Figure out ways to bring about changes and deal with challenges, and write them down. For example, you could write reminders to yourself to eat a healthy snack before going out for a meal, to avoid being too hungry to resist higher-calorie foods, or to keep fruit or unsalted nuts in your bag or car; or you could make a list of enjoyable activities that will distract you from thoughts of food when you are tempted to snack.

Once you feel confident that your weight-loss plan is achievable, you might find it helpful to take time to list strategies for overcoming temptation when your resistance is low. Keep the list at hand so that you can refer to it whenever you need inspiration.

Setting targets

Being realistic about how much weight you're likely to lose will help you avoid feeling discouraged. Ask yourself whether your target is realistically achievable. If it seems overoptimistic, set yourself smaller targets that you can reach quickly and easily. For example, aiming to lose 1 lb by next week is far easier to work toward than a goal of losing 20 lb by next year. All of those single 1-lb weeks will soon add up. Being successful once in doing what you have planned means you are likely to succeed again.

You may also find it useful to set targets related to food intake rather than weight. For example, if you decide to cut out or cut down on certain foods during the week, you will feel more positive at the end of the week when you have achieved it—particularly if your weight loss is a little slower than you would like.

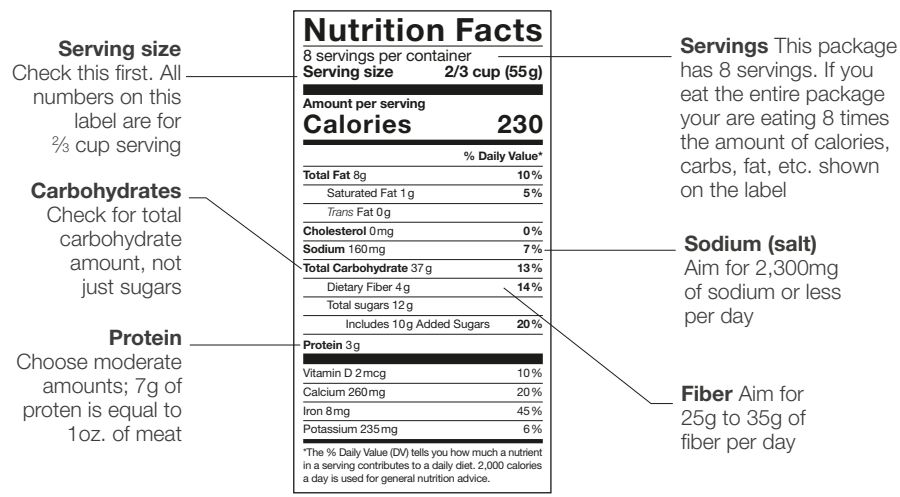
Calorie counting

The number of kilocalories (usually shortened to calories) listed for foods and drinks tells you their energy content. To maintain a healthy weight, you need to eat about 2,000 calories per day if you are a woman, and 2,500 calories per day if you are a man, depending on your age and activity level.

A good weight loss target is ½ to 1 pound per week. Remember, a smaller person burns fewer calories per day than a larger person. You won't be able to go back to eating the same amount you did

UNDERSTANDING A FOOD LABEL

Understanding the Nutrition Facts label on food items can help you make healthier choices. The label breaks down the amount of calories, carbohydrates, fat, fiber, protein, and vitamins per serving of the food, making it easier to compare the nutrition of similar products. In general, eat more foods that are higher in vitamins, minerals (such as calcium and iron), and fiber. Eat fewer foods that are higher in added sugars, saturated fat, and sodium (salt), and avoid trans fat.

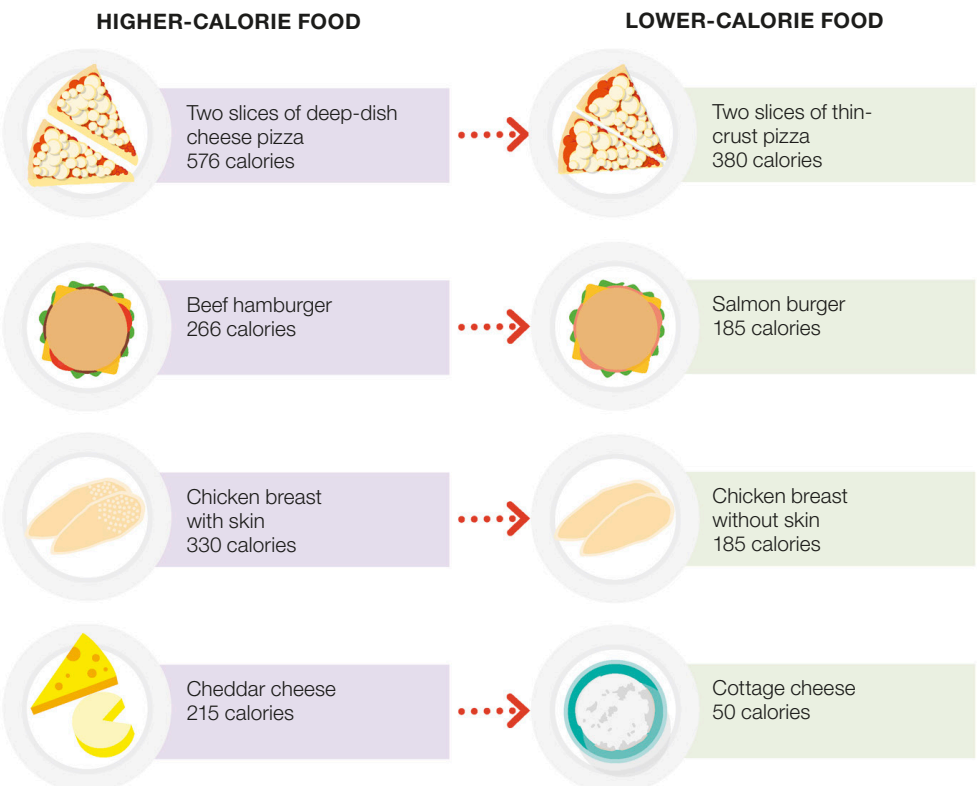


before losing weight. Fat contains double the calories of the same weight of carbohydrate, so cutting back on fats in your diet is a good start. However, you still need a variety of food types to supply all the nutrients you need, so excluding an entire type of food, such as carbohydrates or protein, is not healthy. Cutting out carbohydrates is particularly unhealthy, as it is your main source of energy. It is best to eat smaller portions of different types of foods, making sure that you include all the food groups daily.

YOUR MINDSET

Losing weight is as much a mental as a physical challenge. You are more likely to succeed if you plan how to manage when it's hard to resist temptation, you're not in control of what to eat, or you're feeling unhappy about your progress. Build up a nonjudgemental support network of family and friends, others trying to lose weight, health professionals or coaches, and diabetes-related or general weight-loss groups and organizations.

You are much more likely to succeed in losing weight if you set practical, realistic targets



◁ **Food swaps to reduce calories**
You can make simple food swaps on an everyday basis that will reduce your calorie intake and help you lose weight without denying yourself foods you like. Examples of calorie-reducing food swaps are shown here, but you can make your own list by using nutritional data from online or other resources.

PROS AND CONS OF INTERMITTENT FASTING	
PROS	**CONS**
Helps you to feel less restricted than a plan you follow every day, which can feel easier and be motivating.	Feeling hungry can be uncomfortable, especially at the start.
It is effective for fairly rapid weight loss so you see results quickly.	You need to drink more fluids to compensate for the fluids you would otherwise have gotten from food.
You can be flexible with fasting days and timings.	Your fasting or time-limited days may be inconvenient for work or social reasons.
It can benefit other important aspects of your health, for example lowering blood pressure and cholesterol levels.	Lower-calorie or time-limited eating may not fit well with your diabetes regimen, for example, causing more hypoglycemia episodes.

How to reduce calorie intake

At first, you may need to refer to a book or website listing the calorie contents of foods and weigh some foods, to work out exactly how many calories you are taking in. You can then use your food diary to identify where extra calories are coming from and decide how to reduce your calorie intake. Knowing how to read the nutritional information on food labels (see p.96) will help you make healthier choices when you are shopping.

Some types of food and beverages are deceptive, so you may be consuming them without realizing how many hidden calories they contain. For example, fruit juice is high in sugar; alcohol contains a lot of calories; and some sauces that accompany meals are high in fat.

If you are physically active, you can allow yourself a few more calories and still lose weight: physical activity burns calories while you are doing it as well as raising your metabolic rate (the rate at which your body uses up energy) for a period afterward.

Intermittent fasting

In this regimen, you reduce your daily calorie total on certain days of the week (for example, from 2,000 calories a day to 1,000 on Mondays and Thursdays or on alternate days), or by creating a daily eating time window (for example, only eating between 11 a.m. and 7 p.m. every day or on certain days). By eating fewer calories at these times, and following healthy eating principles (see pp.74–75) at other times, you reduce your overall calorie intake. Fasting can also help you to more easily identify times when you feel hungry or full but needs careful planning when you have diabetes (see panel opposite).

Low-carbohydrate eating

Reducing carbohydrates can reduce both calories and blood glucose levels. To follow a lower-carbohydrate eating plan, you reduce your portion size of carbohydrates or replace higher-carb foods with lower-carb ones and also eat healthy foods from other groups, such as fat and protein, so that you feel full and avoid being too hungry.

Cutting out carbs completely is not the purpose of low-carbohydrate eating, as you still need other nutrients that carbohydrate foods provide, such as vitamins, iron, and fiber. Like intermittent fasting, lower-carb eating helps you to lose weight by reducing your overall calories so that you use up energy stored as fat. By still eating some carbs each day or meal, you feel less deprived, which in turn makes losing weight feel easier. Low- or lower-carb eating may also help you if you are trying to prevent type 2 diabetes (see pp.22–23). Whether you have type 1 or type 2 diabetes, you

will need to monitor your blood glucose and adjust your diabetes medication or regimen according to your blood glucose level while reducing your carbohydrate foods.

Dieting and ketones

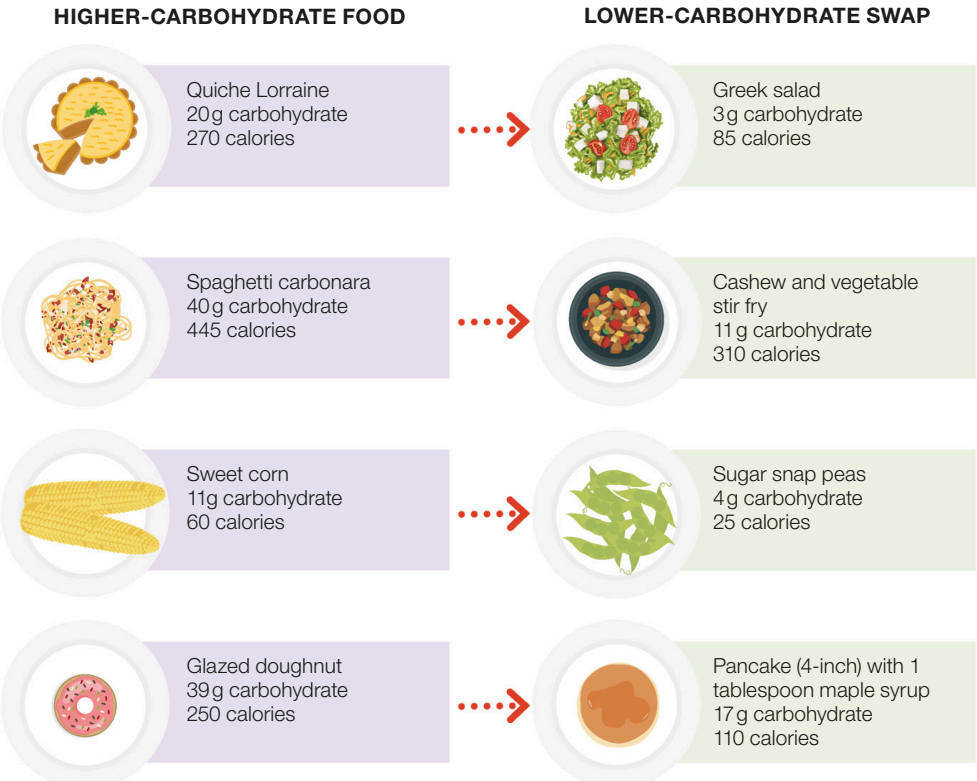
When you restrict your calorie intake, you force your body to burn its fat stores for energy. As part of this process, your body may produce by-products known as ketones, which are excreted from your body in urine.

Producing ketones can be normal if you are losing weight. However, for people with type 1 diabetes, producing ketones when you have a high blood glucose level can be toxic and indicate a dangerous lack of insulin (see p.71).

MANAGING YOUR DIABETES WHEN ON A NEW EATING PLAN

Before you start any new eating plan, you need to think about how to coordinate it with your diabetes management.

- Plan in advance how to manage your blood glucose levels and your use of insulin or other medication.
- If you are not sure how to make changes yourself, work out a plan with a health professional—ideally a registered dietitian.
- Have a short initial trial period of your new eating plan, such as 1–2 weeks, to assess your progress.
- Hypoglycemia is a particular risk, so monitor your blood glucose carefully several times a day, especially when first reducing your food.
- Drink extra water or low-calorie fluids to keep hydrated, in order to compensate for lost fluids in food.



◁ **Food swaps to reduce carbohydrates**
You can eat fewer carbohydrates and fewer calories by reducing the portion size of your meal or by swapping higher-carbohydrate foods for lower-carbohydrate ones that are lower in calories while still giving you a range of nutrients.

▽ **Jogging for health**
Regular physical activity helps you to manage your weight and increases muscle tone and strength. It also helps your body to use insulin more efficiently to keep your blood glucose level in your target range.

Physical activity

Having a reasonably active lifestyle makes a huge difference to your general health and well-being as well as to your diabetes. Whether you want to walk, dance, or run a marathon is up to you: if you are moderately active on a regular and long-term basis you will feel the benefits.

FITTING MORE ACTIVITY INTO YOUR DAY

- Walk or bike short distances instead of driving.
- Get off the bus one stop earlier and walk the rest of the way.
- Use the stairs instead of the elevator if you are only going up one or two floors.
- Park your car a little further from your destination.
- Incorporate a short walk into your daily routine, perhaps after lunch or in the evening.
- Do some extra gardening or housework.

Benefits of activity

Being physically active is good for everyone but is especially important when you have diabetes. It strengthens your heart, muscles, and bones, improves circulation, and helps you to manage your weight. Being active also makes you feel fitter, healthier, and happier, partly because your body is working more efficiently and partly because activity raises levels of brain chemicals that influence your mood. If you are prone to depression, physical activity can help prevent or reduce this.

When you have diabetes, as little as 150 minutes of moderate activity a week can help to regulate your blood glucose level and reduce the risk of developing long-term complications. If you have type 2 diabetes, regular activity helps to reduce insulin resistance, which helps the insulin still produced by your own body to work more efficiently. This may delay the need for increases in the dosage of your medication or mean that you do not need to start taking insulin. If you have type 1 diabetes, being more active helps the injected insulin to work more efficiently, as well as having the health benefits described above.

How fit are you?

Before you start regular activity, check your existing fitness and activity levels. Can you climb two flights of stairs without shortness of breath or tiredness in your legs? Do you normally take the stairs rather than the escalator or elevator? Would you walk for a 10-minute trip rather than drive? Can you have a conversation during light to moderate activity, such as walking? Do you do 150 minutes of moderate physical activity that makes you sweat and breathe harder every week? If you answered “no” to any of the questions above, you could benefit from being more active (see pp.102–105).

CALORIES USED BY EVERYDAY ACTIVITIES

Day-to-day activities use a surprising number of calories. Doing daily chores as part of your activity program is a good way of boosting your calorie expenditure.

ACTIVITY	CALORIES PER 30 MINUTES
Climbing stairs	330
Gardening, digging	240
Housecleaning	120
Gardening, weeding	105
Ironing	60

Being more active

With planning and encouragement, you can find ways to enjoy a more active life and become fitter and healthier. Find activities that you like doing and get started by building up slowly and developing a routine. Whichever type of diabetes you have, being more active will improve your general health as well as your blood glucose levels.

Getting started

Having diabetes places no restrictions on the type of physical activity you can do. However, if you haven't been active for some time, your best route is to start with any form of gentle activity, assess its effect on your blood glucose level, and adjust your diabetes care accordingly. You can then build up your fitness program gradually.

Once your body is used to regular activity you should aim to be active enough to feel warm and slightly out of breath. If you can sing while you are active, you could probably work harder; if you feel you are gasping for breath, slow down and get your breath back. Your activity is too hard if you experience any pain.

Physical activity doesn't necessarily mean competitive sports or weight training. It also includes less vigorous exercise, such as walking, gardening, or housework. Doing something moderately energetic (for example, brisk walking, water aerobics, or riding a bike) for 30 minutes a day, five times a week (or at least 150 minutes a week), will improve your fitness and help you to manage your blood glucose more easily.

GETTING AND STAYING MOTIVATED

- Set realistic goals and gradually make them more challenging.
- Keep a record of your activity plan and your exercise program. It can help you to see what you have achieved. It can also help you identify where your plan worked and where it might need to be changed.
- If a situation occurs to prevent you from being active, such as illness or a change in your working hours, don't feel that a lapse means you have failed—revise your plan and get back to your activity as soon as you can.
- Devise a non-food reward system for yourself to celebrate your success at regular intervals.
- Consider whether a fitness tracker or app could help. These can be set to your personal goals and prompt you to be active regularly.
- Look for ways to be active throughout the day. Park your car farther away at work, or take the steps instead of the elevator, for example.

Building up your fitness

Fitness is a combination of stamina, flexibility, and strength. If your aim is to improve your fitness, you need to do regular activity that makes your heart and lungs work harder (to build stamina), improves mobility in your joints (to increase flexibility), and develops your muscle strength.

If you want to lose weight, you may find that gentle activity, combined with changes in your food intake, is enough to achieve this. If this doesn't work, you will need to burn more calories to lose weight. You could do this by increasing the intensity of the activity, by doing it more often or for longer, or by choosing

FITNESS BENEFITS OF DIFFERENT ACTIVITIES

When selecting a new activity, you can choose which aspect of your health and fitness to work on: weight loss, stamina, flexibility, or strength. The fitness benefits of selected forms of activity are indicated below on a scale of 1 (small) to 5 (excellent).

ACTIVITY	CALORIES PER 30 MINS	STAMINA	FLEXIBILITY	STRENGTH
 **Aerobics**	215	●●●●	●●●	●●
 **Cycling (fast)**	280	●●●●	●●●	●●●
 **Running**	245	●●●●	●●	●●
 **Swimming (fast)**	300	●●●●	●●●	●●●●●
 **Tennis**	210	●●●	●●●	●●●
 **Walking (brisk)**	180	●●	●●	●●

an activity that uses more calories. With any type of activity, remember to warm up before and cool down afterward. Finish by stretching.

If you aren't able to fit in or get to outside activities, you can still build up your fitness at home, for example, by following exercise programs online, on television or DVD, or in printed media. If you have mobility difficulties, your health professional will be able to help you find a personalized activity program.

Planning your activity

You may find it helpful to work out an activity plan. The more detailed your plan, the more likely you are to succeed.

- Decide what you want to achieve—for example, do you want to feel healthier or lose weight? Your goal will help you plan which type of activity and how much of it you need to do.
- Choose an activity that you will find enjoyable—you're more likely to find the time to do it.
- Be realistic about how often you will be able to pursue an activity. Will you be able to fit it into your normal day, or will you need to find extra time to do it?
- Consider teaming up with a friend, partner, or family member. This may make getting fit more enjoyable and also give you the encouragement you need to stay active.

Activity and blood glucose

Physical activity affects your blood glucose level. The effect depends on the intensity and the amount of time you exercise. If you take insulin or pills to manage your diabetes and you exercise intensively or for a long period, monitoring your blood glucose level closely will help you take action to prevent hypoglycemia.

How activity affects blood glucose

When you exercise, you need extra energy. Your body gets the energy it needs by converting the glycogen that is stored in your liver and muscles back to glucose. It also gets energy from the fat stored around your body. Gentle activity for 10–30 minutes is unlikely to have much effect on your blood glucose level. However, if you are more vigorous, your blood glucose level will fall because of the extra glucose your muscles are using. When you stop being physically active, your muscles and, to a lesser extent, your liver replace their glycogen stores by taking glucose from the bloodstream. The longer or more intense the activity, the more glucose is needed to replenish these stores, so your blood glucose level could be affected for several hours afterward.

Checking your blood glucose

If you are starting physical activity for the first time, use your blood glucose readings to check the effect that everyday activities, such as shopping and gardening, have on it. That will give you baseline information against which you can assess the effect of your new physical activity. If you already do some regular physical activity that is not very

▷ **Impact of activity on blood glucose**
If you are moderately active for 30 minutes or more, your blood glucose level changes throughout the activity. The more intense or long-lasting the activity, the greater the impact on your blood glucose.

If you are **active** for more than **an hour**, it is advisable to **check** your **blood glucose** level in the **middle** of your activity

strenuous, note what effect that has on your blood glucose level and then compare it with the effect of more vigorous activity.

If you take insulin-stimulating medication or insulin, check your blood glucose level before and after activity, and again a few hours later. If you are active for more than an hour, check your blood glucose in the middle of the activity.

▷ **Keeping track of blood glucose**
You will need to monitor your blood glucose level before and after exercise so that you know the effect of exercise and whether you need a snack to prevent hypoglycemia.

BEING PHYSICALLY ACTIVE SAFELY

Physical activity, especially prolonged or strenuous activity, can cause changes in your blood glucose level.

- Keep sugary food or drinks available in case your blood glucose level starts to fall.
- Take your blood glucose monitoring equipment with you if you plan to be active for an hour or more—you may need to do a check.
- Tell someone where you are going and what time you expect to be back if you are going out for a long walk, run, or bike ride.

◁ **Endurance sports**
Energy-consuming sports, such as long-distance cycling, quickly use up glucose in your blood, so you will need to keep topping up with glucose drinks or snacks.

KEEPING BLOOD GLUCOSE LEVELS WITHIN TARGET RANGE

The following steps help to maintain a healthy blood glucose level and reduce the chance of hypoglycemia and hyperglycemia.

- If you have type 1 diabetes and your blood glucose is above 270 mg/dl, don't exercise until it has fallen.
- If you have a low blood glucose level before you start your activity, you will need to eat something first—ideally, half an hour before the activity (see chart, opposite).
- If your activity is unplanned, you could have an extra snack beforehand rather than adjust your insulin or insulin-stimulating medication.
- If you know that your activity will make your blood glucose level fall, reduce your dosage of insulin or insulin-stimulating medication beforehand.
- If you are intensely active for more than an hour, you will need additional carbohydrates during the activity—energy drinks or sports bars. Drinking water keeps you hydrated.
- If your blood glucose level is still falling a few hours after activity, you will need to eat something.
- Keep records of your activity, food intake, and blood glucose level to help you to work out the best way to manage next time.

Managing your blood glucose

If you have a raised blood glucose level before you exercise and it has not fallen as you expected or has risen even higher after activity, you probably didn't have enough insulin to help your muscles use the extra glucose your liver is releasing into your bloodstream. In future, you may need to increase your pills or insulin dosage to ensure that this is not a risk when you exercise.

If you have type 1 diabetes and your blood glucose level is over 270 milligrams per deciliter (mg/dl), don't exercise until it is lower. When your blood glucose level is this high, you may not have enough insulin circulating in your blood and your body may produce ketones, resulting in ketoacidosis (see p.71). Taking your insulin and then waiting until it has had an effect will rectify this situation.

EATING TO MANAGE BLOOD GLUCOSE BEFORE ACTIVITY

If you take insulin or insulin-stimulating pills, you may need to eat a snack before starting an activity or, if your blood glucose is very high, wait until it is lower. The examples here are based on the intensity and duration of your intended activity, and your pre-activity blood glucose level. Ask your health professional for personalized advice.

TYPE AND DURATION OF ACTIVITY	BLOOD GLUCOSE BEFORE ACTIVITY (MG/DL)	EXAMPLES OF WHAT TO EAT 30 MINUTES BEFORE ACTIVITY
GENTLE: Walking or biking for less than 30 minutes	90 or less	1 slice of bread or 1 piece of fruit
	Any level above 90	Nothing
MODERATE: Playing golf, leisurely biking, playing tennis, or swimming for 1 hour	90 or less	1 slice of bread plus 1 piece of fruit
	90–160	1 slice of bread plus 1 piece of fruit
	160–270	Nothing
	Above 270	If you have type 1 diabetes, activity may not be advised until your blood glucose level is lower. Check for ketones before exercising.
INTENSE: Playing football or tennis for 2 hours. Vigorously biking or swimming for more than 1 hour	90 or less	2 slices of bread plus 1 piece of fruit
	90–160	1 slice of bread plus 1 piece of fruit
	160–270	1 slice of bread or 1 piece of fruit
	Above 270	If you have type 1 diabetes, activity may not be advised until your blood glucose level is lower. Check for ketones before exercising.

Prolonged or strenuous activity

If you take insulin or insulin-stimulating medication and are active for 2 hours or more, you will need to pay even closer attention to your blood glucose level, including for up to about 24 hours after you have finished. This is because your blood glucose level might take this long to return to normal as your body gradually replaces the glucose stores in your muscles. Regular blood glucose checks are essential during this period and, if necessary, you may also need to take action to reduce the chance of having hypoglycemia.

If you want to increase your muscle bulk or are training for a specific event, your exercise regimen needs to be tailored to your needs. Dealing with endurance sports and diabetes is a specialized area and you may need advice from your health professional.

If your blood glucose level is over 270 mg/dl, wait until it is lower before you exercise

FOOT CARE

Many types of physical activity involve putting extra pressure on your feet. Wear comfortable, well-fitting shoes that do not rub and check that they are appropriate for the type of activity you do. Always check your feet carefully for blisters and any other damage, both before and after activity (see pp.122–123). If you do develop blisters or damage the skin of your feet, you will need to make sure they are treated immediately. You may need to avoid activity that may potentially cause further damage until the blisters or skin have completely healed.

Living with diabetes

Managing your emotions

Work

Driving

Vacations and travel

Sex and relationships

Keeping healthy

Caring for your feet

Dealing with illness

Taking medication

Going into the hospital

Women's health

Pregnancy

Gestational diabetes

Giving birth

Life with a new baby

Benefiting from health care

Managing your emotions

When you have any type of diabetes, it is normal for it to affect you emotionally as well as physically. Being aware of your feelings, learning to cope with them, and finding support are all just as important in managing your diabetes as the medical aspects.

Recognizing the emotional effects of diabetes

When you are first diagnosed with diabetes, you may experience shock, surprise, anger, fear, or even relief at knowing the cause of health problems you may have been experiencing. Individual reactions can vary greatly—the important thing to know is that it's normal to have an emotional response.

As you become accustomed to knowing you have diabetes and are more familiar with managing it, your feelings are likely to change. Discussing your emotional responses, as well as your medical treatment, with your healthcare professionals will help you to become more confident in managing your diabetes. Your feelings may also have a direct physical effect. For example, stress, excitement, or anxiety may affect your blood glucose due to hormones such as adrenaline that are released at such times. Learning how to recognize and deal with these effects is also part of managing your diabetes, which is why it's important to discuss your emotions in your regular checkups with healthcare professionals.

Dealing with the emotional effects of diabetes

Identifying how you feel and whether these feelings are affecting the way you manage your diabetes is a useful first step in dealing with your emotional responses. You could do this in various ways, for example, by talking about them with your family or friends or by simply writing them down.

Recognizing that it is understandable to have negative feelings about diabetes can help you to realize that you don't need to feel guilty about these feelings or that you are failing. Being aware of your feelings also means you will notice if you are losing interest in managing your diabetes. If this persists, ask your health professional for ideas to help.

Getting support

Feeling as though you are not alone with your diabetes can help you to cope with the emotions it brings. In particular, peer

▽ **Professional support**
Your healthcare professional can give you advice and support about emotional issues as well as the more medical aspects of managing your diabetes.

△ **Reducing stress** *Regular relaxation exercises can help to reduce stress. This, in turn, may help you to feel more in control and may also reduce stress hormones, such as adrenaline, which can impact your blood glucose.*

support from other people living with diabetes can be very helpful. You can connect with them in person, through local support groups, national diabetes organization meetings and conferences, or online and social media. Your diabetes health professionals can also help you find sources of support, and, if necessary, arrange for additional professional help if you are experiencing more serious psychological problems (see pp.176–179).

Diabetes-related distress and burnout

Sometimes, the relentless day-to-day management of your diabetes can become a burden and you may feel overwhelmed by the demands of living with a condition that never goes away. You may start to take less care of yourself, for example, by paying less attention to your diabetes. Commonly known as diabetes burnout, there are things you can do to deal with it:

- Try to identify any specific concerns you have and then find out if these are justified—for example, your personal risk of long-term complications.
- Consider ways to reduce the physical demands of managing your diabetes. For example, if you use the fingerstick method to check your blood glucose, you could try a flash monitor (see p.35 and p.37).
- Practicing progressive relaxation, deep breathing exercises, or mindfulness regularly every day can help you to feel less stressed and more in control.

Work

With diabetes, you can do almost any type of work, for example a politician or an Olympic athlete. With rare exceptions, having diabetes will not prevent you from getting a job or keeping your existing one, and there are many ways you can adapt your regimen to minimize any problems. If you do experience difficulties, information, help, and support are available from various sources.

Applying for jobs

You do not need to tell a prospective employer about your diabetes, nor are they legally allowed to ask you about your health. However, you could decide to be open about your diabetes and how you manage it, as a way of showing you look after your health. If you do apply for a job that has restrictions for safety reasons—for example, in the emergency services—you may have to declare your diabetes. The armed forces are by law not open to people with diabetes, but there are very few other blanket bans like this in place.

Managing your diabetes at work

Your decision to tell or not tell your employer about your diabetes may depend on what type of diabetes you have and what effect it will have on your job. For example, if you need to take insulin or insulin-stimulating medication and you work shifts involving driving or using machinery, this will have more implications for your medication timings and safety if you experience hypoglycemia (see pp.62–67) than if you work more regular hours in an office. Your employment contract and your employer's health and safety policy will specify what information you need to give and to whom. If you are at risk for hypoglycemia, telling your manager and/or human resources about your diabetes and its treatment is advisable so that someone can help if you do have hypoglycemia.

Under US law, diabetes can be considered to be a disability. This means that employers need to make reasonable adjustments to accommodate what you need to do to take care of your diabetes. For example, you may need to work in a different area, have breaks at specific times, or take time off for diabetes health appointments or education.

In general, looking after your diabetes will contribute to your health, which will help you do your job as well as possible. You can manage your diabetes as discreetly or openly as you wish. It is sensible to devise a plan for your medication, eating, and blood glucose monitoring to fit in with your routine, and your health professional can help you with this. They can also help you adapt your regimen, if necessary, to make life

However busy your job, it is important to care for your diabetes in order to feel well

at work easier. For example, you might consider using a flash monitor (see pp.35 and 37) to make blood glucose checking quicker, or a longer-acting type of medication (see pp.44–45 and 58–59) so that you don't have to take doses at work. Thinking about how to avoid and treat hypoglycemia and what equipment to store at work is also helpful.

Dealing with problems

If your diabetes does start to cause problems at work—for example, if you develop a complication that makes you less able to do your job—you need to inform your employer so that you can discuss possibilities for the future. If you feel you need support in this situation, your health professional may help.

Many employers are understanding and flexible in relation to diabetes-related needs, but in some situations you may feel you are experiencing discrimination because of your diabetes. If you suspect this is the case:

- Obtain evidence of the issue, in writing if possible.
- Consult the health and equality policies of the company you work for.
- Ask your health professional for advice and support.
- Seek help from national diabetes organizations.
- If necessary, obtain expert legal advice, for example, from an advice center or employment lawyer.

▽ **Managing work and diabetes**
Caring for your diabetes will help you perform well at work. Whether you tell your colleagues about your condition is your choice, but if you are at risk of hypoglycemia, it can be helpful if they know what to do.

Driving

People with diabetes can obtain a license for most types of vehicles and can continue driving. However, there are special precautions you should take when you have diabetes and drive, and there may be specific regulations that you need to be aware of. These regulations vary from state to state.

How diabetes may affect driving

An episode of hypoglycemia (see pp.62–67) can seriously impair your ability to drive safely, so it is vital to take precautions to avoid one. You should also ensure that your vision is good enough to drive safely (see pp.182–183). If you have nerve damage (neuropathy, see pp.188–189), it is important that this does not compromise safe driving.

Rules and regulations

Each state has special driver's license rules and regulations about medical conditions. Some may apply to people with diabetes. While certain states apply rules to all drivers with diabetes, others apply them only to those who take insulin or who have symptoms such as seizures, hypoglycemia, neuropathy (lack of sensation in your feet), or vision problems.

▽ **Driving and diabetes**
Taking a little extra time and care with your diabetes when driving will make your journeys safer (see opposite).

When applying for a driver's license, carefully review the questions about medical conditions. Your answer might decide if you qualify for a license or need further evaluation. For example, if a question asks about a condition that has caused you to lose consciousness, and you haven't had severe hypoglycemia, you could answer no. If asked whether or not you have diabetes, you would need to answer yes. Contact your state licensing agency to get accurate information about requirements for a driver's license.

A driver's license may be suspended for a period of time after an episode of hypoglycemia while driving. To reinstate the license a road test may need to be taken.

Commercial driver licensing is governed by different rules. Commercial drivers with diabetes have to follow certain rules in order to keep driving. You can learn more about these rules from the American Diabetes Association (www.diabetes.org).

Safe driving

Some diabetes complications might make it difficult to drive safely, so precautions need to be taken to ensure your safety behind the wheel. The most potentially serious risk when driving is having hypoglycemia.

You are at risk of having hypoglycemia only if you use insulin or insulin-stimulating medication to manage your diabetes. In either case, you must be sure you are fit to drive before starting a trip, and check your blood glucose level frequently during the trip (see chart, below).

SAFE DRIVING CHECKLIST

Check your blood glucose level before you drive, however short the trip. Only drive if your blood glucose is in the recommended range and above 90 mg/dl.

Do not drive if your blood glucose is below 90 mg/dl. Eat something if it is 70–90 mg/dl or treat hypoglycemia if it is below 70 mg/dl. Recheck in 15 minutes to see if it is safe to drive.

Stop at least every 2 hours during a long trip and check your blood glucose.

If you become hypoglycemic while driving, stop the car, turn off the ignition, move to the passenger seat, and treat it. Wait until your blood glucose has risen above 70 mg/dl and you are feeling well before driving again.

Do not delay meals or snacks, or taking your scheduled medication because you are driving. If necessary, stop and eat or take your medication.

Keep supplies of food and drink to treat hypoglycemia where you can reach them easily in the car (not in the trunk).

Take blood glucose monitoring equipment (meter, lancing device, lancets, and strips) with you, even if you use a continuous or flash monitor.

Carry diabetes identification, your driver license, your insurance documents, and a mobile phone.

Vacations and travel

When you are away from home, a different environment or routine is likely to affect your diabetes management. For example, long-distance travel, changes in temperature, and different foods, drinks, or activities can all affect your blood glucose. But by planning ahead, you can help to avoid potential problems.

Before you go

Check that your travel insurance covers diabetes and diabetes-related problems while you are away—including any hospital stay—and for your return journey. You should take more than enough diabetes equipment and medication for your trip, because it may be difficult to find replacements on short notice, even within your own country.

If you will be flying, ask your health professional for a letter stating that you have diabetes, what medication and equipment you will be carrying, and explaining that they must be kept in your hand luggage. When packing, split your diabetes supplies in separate bags, in case one gets lost or separated from you. If you use an insulin pump, flash monitor, or continuous glucose monitor, these cannot be screened by an X-ray or other security scanner, so before you travel, contact your airline and the airports you will be traveling through about special security arrangements.

THINGS TO PACK

- Insulin or pills—at least double the supply you need, plus the written prescription and original packaging
- Blood glucose monitoring meter, lancets, and test strips
- Small cooler or insulated bag for insulin
- Fast-acting carbohydrates to treat hypoglycemia
- Backup insulin pens, if you use a pump
- Identification, including your medical alert ID
- Information on managing your diabetes when you are unwell
- Insurance details, and your health professional's contact information

Looking after your equipment and medication

All of your equipment and medicines should be stored in a cool, dry place. Unopened insulin bottles, cartridges, or disposable injection devices should be kept in at a temperature of 36–46°F (2–8°C). If you don't have access to a fridge or are traveling long distances, use a small cooler or insulated bag. If you are flying, keep your insulin in your carry-on—it can freeze in the hold of a plane. The insulin you are currently using will be safe up to 78°F (25°C) for up to a month, if you keep it out of direct sunlight. In higher temperatures, you will need to keep it cool. In cold climates, you need to keep your insulin above 36°F (2°C).

Crossing time zones

Traveling across time zones can affect your blood glucose, eating pattern, and the timing of your diabetes medication

(including insulin). Checking your blood glucose every few hours will enable you to find out whether you need any extra medication or food. It will also alert you to hypoglycemia (see pp.62–67) or hyperglycemia (see pp.68–71).

If you are concerned about how crossing times zones may affect your diabetes management, ask your health professional for advice before you travel.

While you are away

In hot conditions, your diabetes medication may take effect faster than usual. This may make you prone to hypoglycemia, and you may need to reduce your medication dose or eat extra carbohydrates to compensate. If you become cold, your diabetes medication may take longer to work, resulting in hyperglycemia. Wearing warm clothes and being active can counteract this, so your blood glucose shouldn't rise too high. Trying new foods, drinks, and activities may also affect blood glucose. Checking it frequently will give you the information to make the appropriate adjustments to keep your blood glucose in the recommended range. To avoid stomach upsets, which may cause your blood glucose to rise, you should be keep track of what you eat and drink. It is also important to look after your feet. Wear comfortable shoes, never go barefoot, even on the beach, and check your feet frequently.

◁ **New activities**
Having diabetes doesn't have to stop you from enjoying a new activity, such as hiking, on vacation or at any other time. You just have to plan ahead to make sure you can continue to manage your diabetes successfully.

Sex and relationships

Diabetes can affect both you and your partner. It can contribute to conflicting emotions, often due to love, concern, stress, or fear. You may also have practical concerns around contraception, pregnancy, sexual function, and managing your blood glucose levels.

Talking to your partner

You may be wary about discussing your diabetes, especially if you have just been diagnosed or if you have a new partner. However, sharing your feelings, ideally when neither of you is feeling pressured, can help you to understand and support each other. Finding ways of involving your partner if they want to feel included can help. For example, you could invite your partner to your diabetes reviews so that they can get a better understanding of any treatment that you need.

Sex and blood glucose control

Sexual activity can use up a lot of energy, so it should be treated the same way as other types of physical activity (see pp.104–107). Checking your blood glucose before you have sex and again a few hours later will help you to gauge the effect and decide whether you need to take any measures to prevent hypoglycemia. You may find that you need to either reduce your insulin dose beforehand or eat more to keep your blood glucose in your target range. Bear in mind that your blood glucose level can fall several hours after physical activity.

If you are taking insulin or insulin-stimulating medication, there is a risk that sex could cause hypoglycemia. Keep fast-acting carbohydrates on hand in case you experience hypoglycemia, so you can deal with it quickly. Your partner may need to give you a glucagon injection if you become unable to treat your low blood glucose yourself (see pp.66–67).

Sexual function

Problems with sexual performance may have physical or psychological roots. Erectile dysfunction (see p.201) is recognized as a complication of diabetes in men. Sexual function has been less widely researched in women, but it is thought that diabetes can affect a woman's sexual response. Vaginal dryness is a fairly common complaint, while some women might find sex painful, lose interest in sex, or be unable to achieve an orgasm as they used to. If you are experiencing difficulties, you can talk to your health professional about treatment options or counselling.

PREGNANCY AND CONTRACEPTION

It is vital to plan any pregnancy (see pp.132–135) and manage your blood glucose in advance. There is a wide range of contraception methods—for example, condoms and other barrier devices; hormonal methods, such as the contraceptive pill; mechanical methods, such as the IUD; and natural methods that rely on identifying less fertile times in your menstrual cycle. What method is most suitable for you may depend on your age and on your overall health and diabetes management. Talk with your health professional about your contraception options.

▷ **Open communication**
Gentle, honest discussions with your partner can help you both manage physical issues and relieve any worries.

Keeping healthy

When you have diabetes, your medical checkups and consultations tend to focus on your diabetes, but looking after other aspects of your health is also important. Health screenings, regular dental and vision checkups, keeping your vaccinations up-to-date, staying generally fit, and sleep are all vital to your health with diabetes.

Routine health screenings

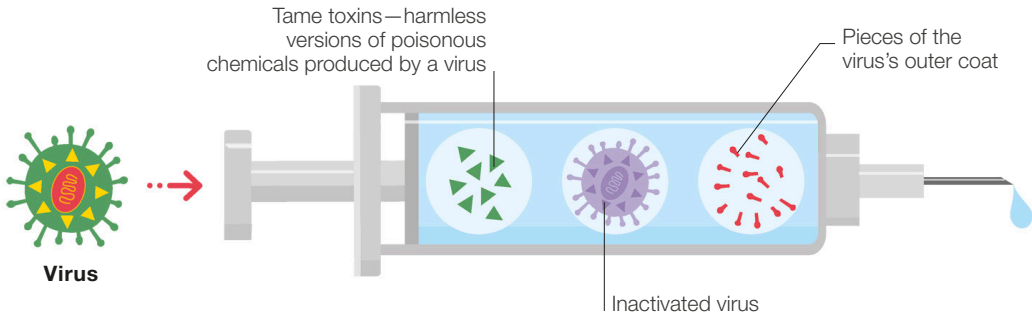
Depending on your age, you should have routine screenings for certain forms of cancer, for example, breast, bowel, and cervical cancer. Keeping up with these screenings is useful—having diabetes does not mean you are at less risk for cancer. If your child has diabetes, they will be have the same developmental checkups as for other children.

Vision and dental checkups

Annual vision checkups for retinopathy (see p.180) are recommended when you have diabetes. Regular eye tests are also important—for example, to check for common problems such as shortsightednes and farsightedness and, if necessary, to prescribe glasses or contact lenses to correct your vision. Regular dental checkups are particularly

▽ **Dental checkup** *Regular checkups of your mouth and teeth by a dentist can help to detect any problems before they become serious, potentially affecting your diabetes management.*

▷ **Vaccines**
Vaccines are made up of an inactivated version of a virus or toxin, or pieces of a virus. They work by priming your immune system, so that it is ready to destroy a real viral infection.



important if you have diabetes, because the condition increases the risk of problems such as gum disease. Early detection and treatment of such problems can help prevent severe infections and possible loss of teeth. In addition, if you develop a dental problem, it can make diabetes harder to manage. As well as regular dental checkups, looking after your teeth and gums by regular brushing and flossing, and following any advice from your dentist will help to keep your mouth and teeth healthy.

Vaccinations

Vaccination against a range of diseases is recommended for people with diabetes—getting an annual flu vaccine, for example. Most vaccinations are offered during childhood or young adulthood, although some, such as shingles, are routinely offered only to older people or special groups, such as pregnant women. When you have diabetes, keeping up with routine vaccinations is especially important. Children and young adults are offered the childhood flu vaccine, and adults of any age with diabetes are offered the flu and pneumococcal vaccines that are usually reserved for those over 65 years old. Being vaccinated is advisable for everybody but is particularly valuable for people with diabetes, as it can prevent you from developing a condition that could make it more difficult to manage your diabetes. If you are traveling to an area where infectious diseases are a risk, ask your healthcare professional about vaccinations for the places you intend to visit and, if necessary, have the recommended vaccines or boosters.

General fitness and strength

For everyone, keeping fit and strong helps overall health. At specific times of life, from middle age onward (and for women, especially after menopause) healthy bones and muscles become particularly important in helping to prevent osteoporosis and falls, with their possible negative effect on your blood glucose and its treatment. Physical activity and weight-bearing exercise will help to keep your bones and muscles strong, as will paying attention to your vitamin D levels.

Sleep

Having 7–9 hours of good-quality sleep is linked with your body cells repairing themselves, regulation of your appetite-controlling hormones, and feeling positive and relaxed. These can all have a beneficial effect on your blood glucose level and how you manage it.

Caring for your feet

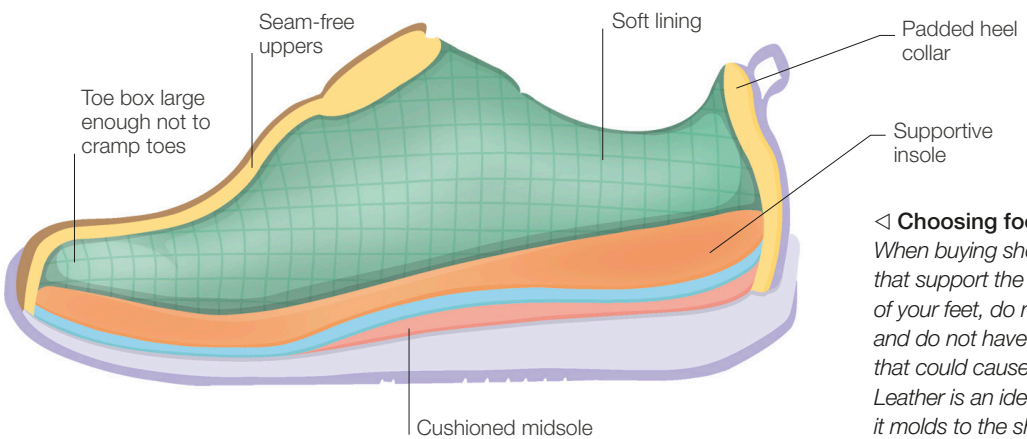
Over time, diabetes can impair your blood circulation or damage your nerves. Your feet are especially susceptible to problems resulting from poor circulation or nerve damage (see pp.188–191), but by making sure you pay special attention to caring for your feet, you can reduce the risk of such problems developing.

Routine foot care

Your feet and circulation will be examined at your annual physical (see pp.142–143), but between reviews you can establish the habit of cleaning and checking your feet every day. Cut your toenails when necessary. However, if you have reduced feeling or circulation in your feet, ask your health professional if it is still all right for you to cut your own nails. If you are not able to cut your own toenails or check your feet properly yourself, ask somebody to help you or consult a registered podiatrist. You can help to prevent injuries by never walking barefoot—not even in your own home.

When buying footwear, try to choose well-fitting, supportive shoes that have enough room for your toes and do not rub. In particular, avoid pointed shoes and high heels for everyday wear, and do not wear them at all if you have reduced feeling or poor circulation in your feet. It is also wise to avoid wearing tight socks, tights, or stockings that rub or cramp your toes.

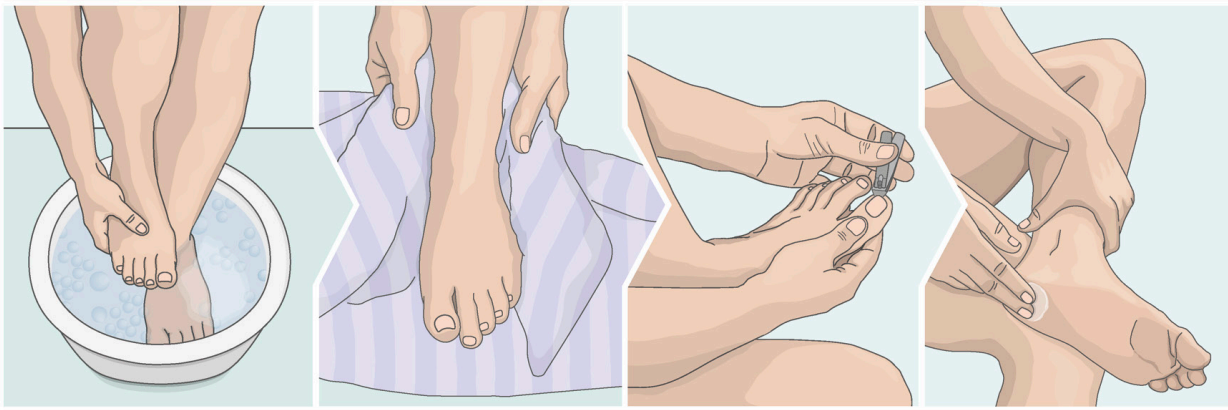
Check your footwear daily to ensure that there are no areas that rub and that there are no sharp objects inside the shoe or sticking through the sole. From time to time, check the soles and uppers of your shoes for uneven wear that may indicate particular pressure areas. Make sure you avoid putting your feet directly in a hot tub or against a hot-water bottle or heating pad, or near an open fire, as you may accidentally burn your feet if you cannot feel the heat.



◁ **Choosing footwear**
When buying shoes, choose ones that support the length and width of your feet, do not cramp your toes, and do not have thick seams or areas that could cause friction or pressure. Leather is an ideal material because it molds to the shape of your foot.

LOOKING AFTER YOUR FEET

A good footcare routine will help you to keep your feet healthy and enable you to notice potential problems early on. Follow this procedure every day, especially if you have reduced feeling or circulation in your feet, and allow plenty of time so that you can check your feet thoroughly for any injuries or other problems.



1 Wash or shower your feet daily in warm water, using a mild soap. Avoid soaking your feet for more than 10 minutes, as this can cause wrinkles, which can be damaged easily.

2 Dry your feet carefully, especially between your toes. Then check for any tender areas, bruising, and cuts or hard or cracked skin on the top and on the soles of your feet.

3 Trim your toenails. Cut them to the shape of, and level with, the end of your toe. Don't cut them too short. Don't use sharp instruments on your nails or anywhere else on your feet.

4 Apply an unperfumed moisturizing cream to your feet, paying particular attention to any hard skin on your soles. Avoid using too much between your toes.

Dealing with foot problems

You can treat certain problems yourself, but some common ones, such as corns and calluses, should be dealt with by a health professional. Athlete's foot can be treated at home with an over-the-counter antifungal medication. Keep the skin clean and dry, especially between your toes. If you have a small blister, do not put pressure on it or pop it. If it does pop, cover it with gauze and check it often to make sure it is healing. Warts will eventually clear up without treatment but they may cause pressure points. They should be assessed by a health professional so that you know how to treat them properly.

GETTING PROFESSIONAL HELP

Many foot problems require professional care, so contact your health professional if you develop any of the conditions below, or if you cannot look after your feet yourself and there is nobody else to help.

- Corns, calluses, or areas of hard or cracked skin.
- Burns or other injuries.
- A sore area that is not healing.
- An ingrown toenail.
- Bruises or discolored areas that have no apparent cause.
- Any new loss of feeling in any part of your foot.

Dealing with illness

Diabetes does not make you more prone to common illnesses, but if your blood glucose is consistently high, you may pick up infections more easily or simply feel unwell. Illness can also affect your diabetes, and how well you are able to manage your blood glucose can affect the speed of your recovery.

GET EMERGENCY MEDICAL HELP

- If you develop symptoms of diabetic ketoacidosis (DKA): fruity-smelling breath; pain in the abdomen; nausea; vomiting; thirst; frequent passing of urine; deep breathing; high and rising blood glucose level; ketones in blood or urine; confusion.
- If you develop symptoms of hyperosmolar hyperglycaemic state (HHS): nausea; thirst; frequent passing of urine; dry skin; high and rising blood glucose level; confusion.

The effect of illness on your diabetes

Whatever type of diabetes you have, illness is likely to raise your blood glucose, because your body responds to illness by releasing more glucose into the blood and producing stress hormones. These hormones make your natural or injected insulin less efficient, which can cause hyperglycemia (raised blood glucose) even if you are not eating anything. One of the symptoms of hyperglycemia is dehydration, which can be worsened by a high body temperature. A sudden, acute illness with vomiting and diarrhea can cause your diabetes to become unmanageable and can also affect other body processes, which, untreated, may be life-threatening.

Blood glucose levels

You may not be ill often, so you may not remember what effect illness has on your blood glucose. Next time you are unwell, make a note of what you do to manage your blood glucose and keep the notes for reference. When you are ill, continue to take your diabetes medication and check your blood glucose frequently. Keeping your glucose level below 180 milligrams per deciliter (180 mg/dl) will help your recovery. You may need to increase your dose of medication temporarily to achieve this.

Although illness typically causes a rise in blood glucose, occasionally illness can cause it to fall (hypoglycemia). In this situation, your dose of diabetes medication may need to be reduced, but you need to be careful that this does not make your blood glucose rise too high.

Eating and drinking

Food and drink give your body energy to combat illness and help to limit the effects of illness on your diabetes. You may also need small amounts of drinks containing glucose. If you can't eat, a day or two without food will not matter too much, but drinking plenty of sugar-free fluids throughout the day is essential to prevent dehydration.

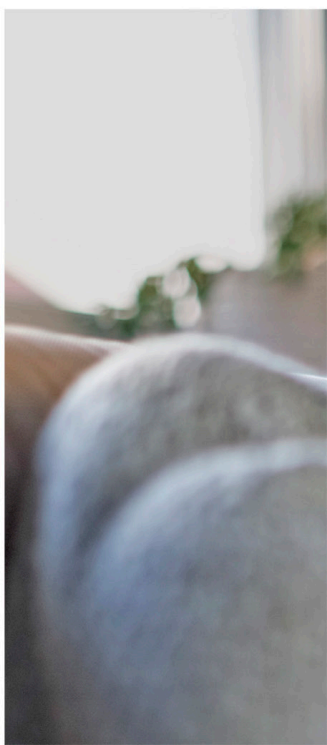
Diarrhea and vomiting

Episodes of sickness and diarrhea may be short-lived, but they can affect your diabetes within a few hours.

Type 1 diabetes

With type 1 diabetes, If you become hyperglycemic and dehydrated as a result of prolonged vomiting and

▽ **Aiding recovery**
When you are ill, it is especially important to continue to take your diabetes medication, to check your blood glucose frequently, and to keep hydrated in order to recover as quickly as possible.



diarrhea, and are unable to keep any food or fluids down, your body may produce ketones. A large amount of these substances leads to a serious condition known as diabetic ketoacidosis, or DKA (see p.71). You can help to prevent DKA by always taking your insulin, even if you are not eating or are vomiting. However, you need to check your urine or blood for ketones to assess the seriousness of your condition. If your blood or urine does contain ketones, or if you have diarrhea and vomiting that continues for more than 2–3 hours, see your health professional immediately.

Type 2 diabetes

With type 2 diabetes, you are at low risk of developing diabetic ketoacidosis if you have diarrhea and vomiting. However, your blood glucose level can still rise extremely high and you can also become very dehydrated, which can lead to a condition known as hyperosmolar hyperglycemic state, or HHS (see p.71). If you are unable to take your diabetes medication or keep any fluids down, contact your health professional immediately.

COPING WITH ILLNESS

- Check your blood glucose at least once every 2 hours to learn how the illness is affecting your blood glucose. If you can't do the tests yourself, ask a relative or friend or contact your health professional.
- Continue to take your diabetes medication, even if you are not eating.
- Make sure you keep well hydrated by drinking 64 ounces (8 cups) of sugar-free fluids throughout the day.
- If you are not able to eat solid food, try milk, fruit juice, or soup at mealtimes.
- If you are vomiting and unable to keep any food or drink down, contact your health professional urgently.
- If you have type 1 diabetes, take small mouthfuls of drinks containing glucose every hour to help prevent ketones from forming.
- If you are ill and are not sure what to do, contact your health professional for advice.

Taking medication

In addition to your diabetes medication, you may need to take other prescribed medication, either short-term for a temporary illness or long-term for an ongoing condition. You may also choose to use over-the-counter medications or take supplements or complementary remedies. You need to be aware of how other medications can affect your diabetes so that you can continue to manage it successfully.

Prescription medications

Short-term treatment with medication prescribed by a doctor or other healthcare professional is frequently all that is needed to treat a wide range of common illnesses. For example, a bacterial infection of the sinuses causing sinusitis often clears up with a short course of antibiotics. In such cases, the antibiotics may also benefit your blood glucose levels, which may have been raised by the infection. Certain prescription medications for ongoing conditions may also affect blood glucose levels or the management of your diabetes. For example, corticosteroid pills or injections, which may be prescribed to treat inflammatory conditions such as rheumatoid arthritis, cause a rise in blood glucose. Some hormone treatments, such as thyroid hormones to treat an underactive thyroid gland, may also cause a rise in blood glucose. However, the contraceptive pill (see pp.118–119) does not significantly affect blood glucose levels. Beta blockers, which may be used to treat high blood pressure, may reduce your awareness of the early symptoms of a hypoglycemic episode (see pp.62–67).

The effects of any prescribed medication on your diabetes depend on the specific drug and also on its form. As a result, if you are prescribed medication it is vital to tell the healthcare professional that you have diabetes and the medication (if any) you use to manage it. In some cases, the healthcare professional may be able to prescribe a medication that has little or no effect on blood glucose or a form of medication that minimizes its effects on blood glucose—for example, taking a medication via skin patches or an inhaler tends to affect blood glucose less than pills or injections. If an alternative medication or form of

USING MEDICATION SAFELY

When you have diabetes, it is important to take special care with medications because of their potential for affecting your diabetes management.

- For any medication, always read the label and the patient information leaflet. If you still have queries about any aspect of the medication, talk to a pharmacist, the prescriber, or other healthcare professional before using it.
- If you are prescribed new medication, make sure you tell the prescriber that you have diabetes and all the medications you are already using, including any non-prescribed medications or remedies.
- If you experience any adverse effects from a medication or remedy that has not been prescribed or recommended by a healthcare professional or if it interferes with your diabetes management, stop using that product.
- If you buy medications online, only use an officially registered online pharmacy to ensure that the medications are of guaranteed quality.

△ **Choosing medication**
A wide variety of medications and remedies can be bought without a prescription. Before choosing a particular product, check with a pharmacist or other healthcare professional.

medication is not an option, you should make sure the prescriber gives you detailed information about how your diabetes management can be adjusted. Your diabetes health professional will also be able to give you advice.

Over-the-counter medications

Some medicines that you can buy over the counter may contain sugar—for example, some cough syrups and cold medicines—which can interfere with your blood glucose management. Sugar-free or low-sugar formulations are preferable, if available, as they will have less effect on your blood glucose. If you have other conditions in addition to diabetes, some over-the-counter medications may be harmful. For example, if you have peripheral neuropathy (see pp.188–189) or reduced circulation (see peripheral ischemia, pp.189–190), some treatments for corns, calluses, or fungal infections may damage your feet. In addition, certain over-the-counter medications may have adverse interactions with your diabetes medication or medication you are taking for other conditions. Before using any nonprescription medications, always read the patient information leaflets and obtain specific advice from a pharmacist or other healthcare professional.

Supplements and complementary medications

None of the wide range of dietary supplements and complementary medications available will cure or treat diabetes or substitute for your prescribed diabetes medication. Depending on the specific product, they may have unpredictable effects on your blood glucose or may interact with your diabetes medication and cause side effects. It is wise to get advice from your healthcare professional before using such products. If you do decide to use them, be sure to monitor your blood glucose carefully while you are taking them.

Going into the hospital

If you need to go to the hospital—whether or not it is related to your diabetes—it will still be necessary to manage your diabetes carefully. Hospital procedures and timetables (for mealtimes, for example) will be different from those you are used to at home, but being aware of what to expect and preparing for it will help your visit be trouble free.

Planned inpatient admission

If you know you are going to the hospital for an inpatient procedure, you can plan ahead for it with the hospital staff and your diabetes health professionals. A planned admission gives you the chance to discuss how much involvement you will have in your diabetes management and what the hospital staff will provide if you are unable to manage your diabetes yourself as a result of your procedure. You will be able to find out about the timings and types of food that will be provided, to decide if you need to bring snacks or hypoglycemia remedies. You can ask about what diabetes equipment you will need to bring with you, because some items may not be available, such as flash monitor or continuous glucose monitor sensors, although insulin and other diabetes medications will be provided. You can also find out about the diabetes specialist team in your hospital, and ask to talk to them them before you are admitted if you need to.

PREPARING FOR A HOSPITAL STAY

- Find out if there is a diabetes specialist team at the hospital and how to contact them before admission to discuss your diabetes management when in the hospital.
- Take your usual diabetes medications and equipment into the hospital or a complete list of everything you use.
- If your treatment can cause hypoglycemia, inform the hospital staff how you usually treat low blood glucose.
- Always carry your diabetes identification (including what type of diabetes you have) in case you have to be admitted to the hospital in an emergency.

If you to go the hospital, always tell the healthcare professionals what type of diabetes you have

Emergency admission

If you have to go to the hospital because of a medical emergency, you may not have your own equipment available, and you will have less control over how your diabetes is managed. If you are able to, tell the hospital staff about your diabetes and its treatment. However, the staff will look after your diabetes using hospital procedures. For example, if you can't eat, you will be given glucose and insulin via a drip, and you will have frequent blood glucose checks so that the insulin and glucose can be adjusted as needed. When you can eat properly again, your regular or adjusted treatment will restart and the drip will be removed.

Outpatient and same-day procedures

As with a planned inpatient admission, for procedures that do not need an overnight hospital stay you will have the chance beforehand to plan how to manage your diabetes in conjunction with the health professionals. For example, if you have to fast before the procedure, you will need advice on extra blood glucose checks and whether you will need to adjust your diabetes medication. When you leave the hospital afterward, you will probably be able to resume managing your diabetes in the usual way, although sometimes you may need to adjust it.

Discharge from the hospital

During your hospital stay, changes may have been made to your diabetes treatment. You can discuss any changes with the hospital health professionals before you leave, and you will be able to ask questions or see the diabetes specialist team so that you understand any new regimen or medication. If you have been eating differently from usual or have been less active in the hospital than at home, you may be at risk of hypoglycemia when you resume your usual activities, so you can also find out whether you will need to make further adjustments once you are back at home.

▽ **Intravenous drip**
When in the hospital, you may be given glucose and insulin directly into a vein via a drip. When you have recovered and can take medication and eat as usual, the drip will be removed.

Women's health

If you are a woman with diabetes, it can be useful to know how your hormones and common female experiences can affect your blood glucose level so that you can take steps to look after your health and minimize the effect on your diabetes.

Your menstrual cycle

During your menstrual cycle, levels of estrogen and progesterone rise and fall. At the start of your cycle, estrogen causes the lining of the uterus to thicken. This is then maintained by rising progesterone levels during the second half of your cycle. If conception does not occur, progesterone levels fall, triggering shedding of the lining of the uterus. These hormonal changes may affect blood glucose levels. If you think this might be happening to you, recording your blood glucose four or more times a day just before, during, and directly after your period will help you to identify any pattern.

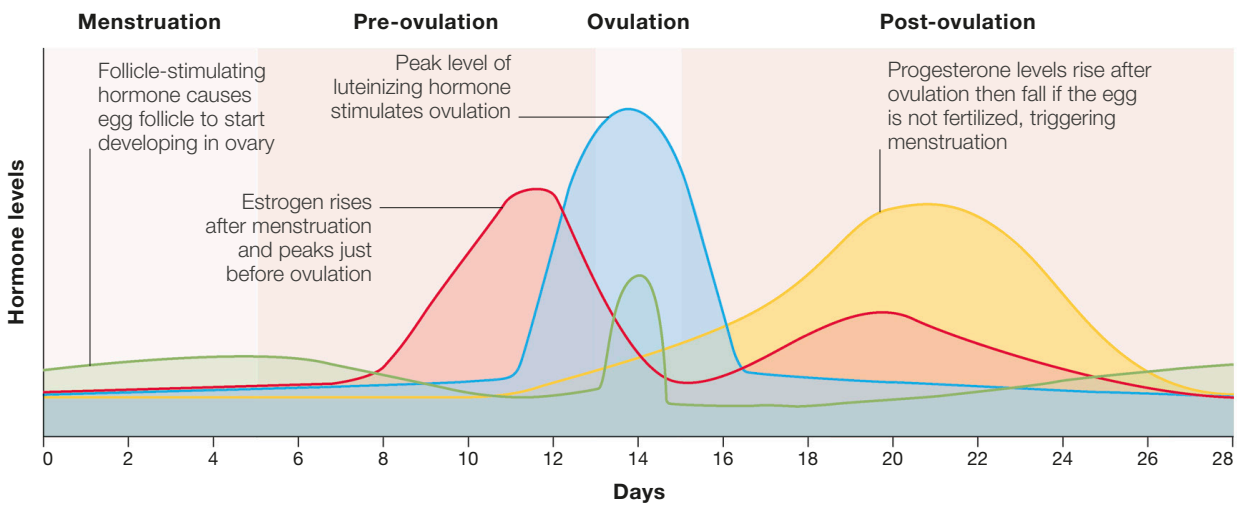
If your blood glucose tends to rise just before your period, you could:

- Try fitting in some extra physical activity to bring your blood glucose level down.
- Try to limit foods with added sugars.
- Try increasing your dose of insulin or other medication in the few days before your period is due.

If, on the other hand, your blood glucose is lower than normal and you have a tendency to have more hypoglycemic episodes, you could:

- Try increasing your intake of carbohydrate-containing foods.
- Reduce your insulin or medication dose in the few days before your period.

The way in which your periods affect your blood glucose is individual but likely to remain fairly consistent, so even if you change your diabetes treatment, over time you should be able to determine how to keep your blood glucose balanced throughout your monthly cycle.



▽ **Hormone levels**
Levels of the main hormones fluctuate throughout your menstrual cycle and may affect your blood glucose. Estrogen and progesterone, in particular, may cause temporary insulin resistance, leading to raised blood glucose levels.

Menopause

Many changes occur in a woman's body during menopause, but these will not necessarily affect your diabetes and its treatment. However, you may find that some symptoms of menopause are similar to those that occur when you have a high or low blood glucose level. If you do feel hot, shaky, or start sweating, taking a blood glucose reading can help you decide whether you need to treat your diabetes at this time. You may wish to consider hormone replacement therapy (HRT), which may help to relieve menopausal symptoms. Ask your health professional whether taking HRT would be right for you.

Changes in levels of hormones during your menstrual cycle may affect blood glucose levels

Stress, emotions, and hormone levels

Mood swings and feeling emotional at times of hormonal change, such as periods and menopause, are common but are usually short-lived. However, managing diabetes can cause extra stress (see pp.110–111). If your low mood or emotional changes are becoming persistent, extra support and treatment may help (see pp.176–179).

MENOPAUSE SYMPTOMS AND DIABETES

Some menopause symptoms can mimic hypoglycemia (see pp.64–65) or hyperglycemia (see pp.70–71). The only way to tell what the symptoms are due to is check your blood glucose level.

MENOPAUSE SYMPTOMS	SIMILAR DIABETES-RELATED SYMPTOMS
Hot flashes and night sweats.	Hypoglycemia may cause sweating.
Palpitations.	Palpitations and a fast pulse may be signs of hypoglycemia.
Mood changes, such as low mood.	Hypoglycemia can cause a change in mood.
Headaches.	Hyperglycemia may cause headaches as a result of dehydration.
Difficulty sleeping, causing tiredness and irritabity during the day.	Hypoglycemia can cause tiredness. Being irritable or anxious may also be signs of hypoglycemia. Hyperglycemia may mean you get up at night frequently to go to the toilet, resulting in tiredness during the day.
Problems with memory and concentration.	Problems with concentration may result from hyperglycemia or hypoglycemia.
Recurrent urinary tract infections.	Hyperglycemia may cause urinary tract infections.
Vaginal dryness, and pain, itching, or discomfort during sex; reduced libido.	Hyperglycemia can cause a yeast infection (candidiasis), producing vaginal itching.
Joint stiffness, aches and pains, and reduced muscle mass.	Hyperglycemia may cause muscle cramps.

Pregnancy

It is important to plan your pregnancy carefully so that your blood glucose is well-managed before you conceive. Throughout your pregnancy, looking after your diabetes and attending prenatal appointments will mean you and your baby are as healthy as possible.

Planning for pregnancy

If you want to have a baby, your health professional will be able to advise you on your blood glucose management, perform preliminary blood tests, check your health in general, and make any necessary referrals. It may be recommended that you start taking a prenatal vitamin. Keeping your blood glucose well managed helps to promote a healthy pregnancy.

You should be checking your blood glucose at least 4 times a day and making sure that most of your levels are in the range of 80–130 mg/dl fasting, and pre-meal. You may need to work toward this by adjusting your insulin, pills, food intake, and activity level. If this is difficult or causes hypoglycemia, you may need to change your insulin regimen—for example, from twice-daily injections to a mutidose injection regimen (see pp.46–51)—or consider using a pump (see p.54). These will enable you to match your insulin dose more closely to your glucose level.

If you take pills for your diabetes, you may need to have insulin injections instead to achieve the blood glucose levels you need before becoming pregnant. When you do conceive, you will probably need to switch to insulin. Your health professional will also review any other medications you take—for example, to treat high blood pressure or cholesterol—as some cannot be taken during pregnancy.

DEALING WITH HYPOGLYCEMIA DURING PREGNANCY

- Eat starchy carbohydrates regularly throughout the day to reduce the likelihood of hypoglycemia.
- Check your blood glucose level at least 4 times a day and adjust your insulin according to the results.
- Sometimes the symptoms of hypoglycemia change during pregnancy, so if you have an unusual symptom, check your blood glucose right away—it could be a sign that you are hypoglycemic.
- Keep glucose tablets, a glucose drink, or glucose gel with you at all times to use as soon as you feel any hypoglycemic symptoms.
- Tell your partner, a friend, or a work colleague that hypoglycemia could occur and, if possible, show them how to give you a glucagon injection (see p.67) or administer glucose if you become unconscious.

When you are pregnant

Intensive blood-glucose management is crucial while you are pregnant, both for your baby's and your own health. If your blood glucose is raised, your baby's will be, too. This is because glucose can cross your placenta into your baby's blood but insulin cannot. If your baby's glucose is high, they will have to produce more insulin to lower it, which causes extra glucose to be stored in your baby's body, resulting in faster growth. Keeping your blood glucose in your target range during pregnancy is also important to prevent ketones from forming (see p.71). These can be very harmful to your baby. They may form even if your blood glucose is not

▷ **Injecting insulin in pregnancy**
You can inject insulin into your abdomen during pregnancy but if you are nervous about doing so, ask your healthcare professional for advice about alternative sites.

high enough to give you symptoms, so it is vital that you increase your insulin dose as soon as your blood glucose starts to rise.

You need to monitor your blood glucose levels frequently and make sure you keep your level well within target range:

- 60–95 mg/dl on waking
- 140 mg/dl or less, one hour after a meal
- 120 mg/dl or less, two hours after a meal

Your health professional may also give you an A1c test (see p.31); ideally, your A1c level should be 6.5 percent prior to becoming pregnant. As your pregnancy progresses, you will need larger doses of insulin to keep your blood glucose at these levels.

If you have type 1 diabetes, you may be offered a continuous glucose monitoring system (see p.33 and p.35)

PRENATAL TESTS

You will have several prenatal tests at intervals throughout your pregnancy, starting as soon as your pregnancy is confirmed. In addition to the standard tests offered to every pregnant woman, certain specific tests are needed when you have diabetes. Some tests may be repeated more often than indicated if there are concerns.

	PROCEDURE	WHEN	REASON
TESTS FOR WOMEN WITH DIABETES	**Blood sample for A1c**	At start of pregnancy (unless recently checked); every 3 months during pregnancy.	To check that your blood glucose level is within recommended range, to ensure your baby can grow and develop healthily, and to help prevent pregnancy problems (see opposite).
	Retinal (eye) examination	Start of pregnancy (unless recently checked) and at 28 weeks; more often if you already have or develop retinopathy.	To look for signs of retinopathy (see pp.180–181), which can develop or worsen during pregnancy.
	Blood sample for kidney function	At start of pregnancy (unless recently checked); during pregnancy if you already have or develop kidney problems.	To ensure that your kidneys are functioning well.
ROUTINE TESTS FOR ALL PREGNANT WOMEN	**Urine sample**	At every visit (every 1–2 weeks when you have diabetes).	To check for the presence of protein, which can indicate preeclampsia (see opposite); also to detect infection or ketones.
	Blood sample for anemia, blood group, and Rh antibodies	At start of pregnancy (unless taken during prepregnancy planning).	To ensure healthy iron levels; to check your blood group in case you need a blood transfusion and also so that you can be offered Rh immunoglobulin if needed.
	Ultrasound scan	At approximately 12 and 20 weeks. Additional scans for women with diabetes at 28, 32, and 36 weeks.	To assess the development and growth of your baby, including checks for specific problems, such as spina bifida, and a specialized heart scan.
	Blood pressure	At every visit.	To check for high blood pressure, which increases the risk of preeclampsia (see opposite).
	Fetal well-being monitoring	At every visit, a physical exam, and later in pregnancy, a nonstress test using a fetal heart monitor.	To check your baby's size, heartbeat, and movements. You will also be asked to keep a daily chart of your baby's movements at home.

during pregnancy. This can make the intensive monitoring of your blood glucose levels easier.

Physical and mental well-being

Having diabetes and being pregnant is hard work. You have to cope with lots of appointments and probably pay more attention than usual to your diabetes care. It's as important to look after your mental health as well as all the physical aspects of being pregnant. Finding someone to listen to your worries, share in planning, attend appointments with you, and encourage you to keep going with your diabetes care can be very helpful. Techniques such as yoga or deep breathing every day help you relax. Eating more healthfully, being physically active on a regular basis—a brisk daily walk or swimming—will all increase your chances of a successful pregnancy.

Planning the birth

You may need special care during labor, so you will be advised to have your baby in a hospital. Your health professional will discuss the options available to you and what you can expect to happen to you and your baby during the birth. To help avoid any problems in late pregnancy, you may be advised to give birth between 37 and just under 39 weeks of pregnancy, by being induced or by cesarean section. In some situations, such as if you have any diabetes or pregnancy complications, you may be offered a cesarean section or induction before 37 weeks.

POTENTIAL PREGNANCY PROBLEMS

Most pregnancies progress smoothly, but all pregnant women face potential problems. Having diabetes makes some problems more likely, but the risks can be reduced by healthy eating, regular physical activity, intensive blood glucose monitoring, and careful management of your blood glucose levels.

PROBLEM	IMPLICATIONS
Worsening of diabetes complications	Eye complications, such as retinopathy, may worsen in pregnancy, so your eyes are checked as part of your prenatal care. Kidney problems before pregnancy can increase your risk of high blood pressure, so this is also checked regularly.
Baby larger than usual	A raised blood glucose level can cause your baby to grow at an increased rate. Keeping your blood glucose levels in target range reduces this risk. If your baby is larger than usual, early delivery may be needed.
Polyhydramnios (excessive amniotic fluid)	If your baby has a raised blood glucose level, they may produce more urine. This can lead to an excessive amount of amniotic fluid in the uterus (a condition known as polyhydramnios), which can cause premature labor.
Preeclampsia (high blood pressure and protein in the urine)	If severe or left untreated, preeclampsia can lead to a life-threatening condition known as eclampsia, which causes seizures and may bring on a coma. If you have high blood pressure, protein in your urine, and fluid retention in the last 3 months of pregnancy, you will be monitored in the hospital until your baby is born, and your labor may be induced.
Premature labor	If labor starts before the 37th week of pregnancy, or you are induced early, your baby may not be fully developed and may need special care when born.

Gestational diabetes

Some women develop diabetes for the first time during pregnancy—this is gestational diabetes. It may be permanent or may disappear once your baby is born. In this case, you still have a high risk of developing type 2 diabetes in the near future, which you can take steps to prevent.

Diagnosis

If you have risk factors, such as previous gestational diabetes or a family history of diabetes, your blood glucose may be checked at your first prenatal visit. If not, you will have this checked at around your 28th week of pregnancy. If you are diagnosed with gestational diabetes, you will be offered more frequent clinic appointments and support from health professionals.

Treatment and monitoring

Your initial treatment may involve adjusting your food. Limiting food and beverages with added sugar and not eating too many carbohydrates can make a big difference to your blood glucose. Your health professional will show you how to check your blood glucose (see pp.36–37) to see how effective changes to your eating habits have been. Your blood glucose targets are to have all readings less than 95 mg/dl fasting and before meals, 140 mg/dl 1 hour after a meal, and 120 mg/dl 2 hours after a meal.

If healthier eating is not enough to keep your blood glucose level in the recommended range, you will be offered regular insulin injections or one of the few pills that are safe to use in pregnancy.

Birth and postnatal care

There is a chance that your baby will need to be delivered by cesarean section or need care in a special unit, so discuss this with your healthcare provider. During labor, you may need a glucose drip and insulin infusion and more frequent monitoring (see p.138).

As soon as your baby is born, your need for insulin will reduce dramatically. You may no longer require insulin or need to check your blood glucose. But because there is a risk of developing type 2 diabetes when you are pregnant, about 6 weeks after you give birth (or sooner if you have symptoms) it is recommended that you have a fasting blood glucose test (see p.21).

Future diabetes risk

Once you have had gestational diabetes, it is likely to recur in future pregnancies. You are also much more likely to develop type 2 diabetes within a few years. You can help to prevent or delay this by breastfeeding, regular physical activity, eating well, and maintaining a healthy weight (see pp.92–93). There are prevention programs to support you with this. You also may be offered a blood test every year to check for diabetes and advised to see a health professional if you develop symptoms.

▽ **Keeping active**
Regular physical activity and avoiding sugary food and beverages can help you to manage gestational diabetes and can also help to prevent or delay future gestational or type 2 diabetes.

Giving birth

For many women with type 1 or type 2 diabetes, giving birth is similar to any other woman's experience, in most respects, especially if your pregnancy has been problem-free. However, your blood glucose will be closely monitored throughout labor and delivery, and you may need intravenous glucose and insulin. Right after the birth, your baby's glucose levels will be checked, too.

Labor and blood glucose levels

Your labor may start naturally before 37 weeks. In this case, contact your hospital for advice; also check your blood glucose at least once an hour, or ask somebody else to do it for you, if that is easier. Taking regular blood glucose readings will tell you how the onset of labor is affecting you and will help hospital staff to support you. After 37 weeks, you will be advised to have labor induced or to have a cesarean section.

If you have type 1 diabetes, if labor lasts a long time, or if it starts when your glucose level may be falling (for example, when you have not eaten for some time), you will be offered an intravenous glucose drip to keep your blood glucose stable until the birth. You may also be given an intravenous infusion of insulin. The amounts of glucose and insulin will be adjusted according to your blood glucose level.

Monitoring and pain relief

Your baby's heart rate, position, and movements will be checked throughout your labor. You can have the same pain relief as any other mother who does not have diabetes, depending on how your labor is progressing.

After your baby is born

Once your baby is separated from your placenta, their blood glucose level may fall. For this reason, when your baby is born, a blood sample will be taken to check whether they are hypoglycemic. In some specific circumstances, such as premature birth, your baby's lungs may not be fully developed. As a result, their breathing will also be checked and, if necessary, they will be helped to breathe at first.

If you and your baby are well after the birth, you will be encouraged to feed your baby immediately. However, if your baby's glucose level is low, they may also need a glucose injection or a tube feed. If your baby is seriously hypoglycemic or is having difficulty breathing, they may be moved to a special care baby unit.

◁ **Blood test**
Your baby will have a heel prick test a couple of hours after birth to check their blood glucose level. They will have further tests until their blood glucose rises; if it remains very low, your baby may be transferred to a special care unit.

△ **Intravenous treatment**
If you have type 1 diabetes, your labor is prolonged, or your blood glucose level falls, you will need intravenous glucose and insulin to keep your blood glucose level stable.

After delivery of your placenta, your need for insulin reduces quickly. If you were receiving an insulin infusion during labor, the dose will be lowered or stopped immediately to prevent hypoglycemia.

Managing your diabetes after the birth
Unless you had a general anesthetic, you will be able to eat and drink soon after the birth. You should then be able to take over managing your glucose testing and insulin injections if you have them.

If you were on pills before you were pregnant, you may need to keep taking insulin until you wean your baby. You can't take most pills for diabetes while you are breastfeeding, because they will affect your baby via your milk.

If you weren't taking insulin or pills before your pregnancy, you may be able to resume or start blood glucose management through healthy eating and physical activity, in which case there are no special issues about breastfeeding.

When your **baby is born**, a blood sample will be taken to **check** whether they are **hypoglycemic**

Life with a new baby

Meals, sleep, and time to yourself or with your partner are all likely to be disrupted once your baby is born, and your diabetes routine is also likely to be upset. Although you can be a little less strict about your blood glucose than when you were pregnant, you still need to aim for a healthy level.

Eating and drinking

It is likely that your usual mealtimes will be disturbed or irregular for a while after having a baby. This can affect how you manage your diabetes and disrupt your blood glucose levels. If you go without food for too long and you take insulin or insulin-stimulating tablets, you may become hypoglycemic; if there are long periods of time between your insulin doses, your blood glucose level may rise.

One way to deal with this is to eat regularly, even though it may sometimes be difficult to have a main meal. You may find it useful to prepare or set aside food such as fruit, sandwiches, or cereal bars each day in case you are unable to eat or drink when planned. If your mealtimes are unpredictable and you take a ready-mixed insulin or are on a twice-a-day regimen, changing to a more flexible multidose regimen might better suit your new lifestyle (see pp.46–47).

Breastfeeding

When you breastfeed, you transfer energy to your baby through your milk. This means that you will need to eat additional carbohydrates each day to compensate for the energy you are giving your baby. Like other new mothers who are breastfeeding, you will probably find that you need to drink more sugar-free fluid than normal to prevent yourself from becoming dehydrated.

If you take insulin or insulin-stimulating medication, you may also need to reduce your dose in order to prevent hypoglycemia. Keep your hypoglycemia treatments (such as glucose pills or glucose drinks) and snacks on hand whenever you are breastfeeding.

Try not to put your baby's food needs before your own. If you feel low blood glucose coming on, treat it right away, whether or not you can check your blood glucose.

HOW TO RELIEVE STRESS

- Try fitting in some physical activity whenever you can – even just going for a walk outside can help.
- Meet other new parents and share your experiences. There are usually local support groups, including for parents with diabetes.
- Ask for support from family and friends – they might be able to give practical help and/or emotional support.
- Rest and sleep whenever you can. Ongoing tiredness can contribute to stress and low mood, and sleep can improve them.

Sleeping

If you sleep when your baby sleeps, you will probably be napping throughout the day. This could result in hypoglycemia if you doze when you are due to eat a meal, or hyperglycemia if you sleep in and miss your injection because you were awake most of the night. If necessary, have a snack if you get up to feed your baby at night.

You may need to consider how to adapt your insulin regimen if your sleeping pattern is unpredictable and is causing troublesome swings in your blood glucose.

Stress and mood

Looking after your new baby and trying to manage your diabetes can be very stressful. After working so hard to manage your blood glucose during pregnancy, it can be difficult to relax and return to your prepregnancy target levels. Finding time to check your blood glucose, eat, and take medication as you would like may also be difficult.

It is not unusual for new mothers to feel slight depression during the first few days or weeks after childbirth. Having diabetes won't make you any more or less likely to experience this change in mood, sometimes known as the "baby blues," nor more serious postnatal depression. However, feeling like this can affect your energy levels and your ability to manage your diabetes as well as your new baby's needs. If you feel you are not coping, talking to your health professional about how you feel is important so that they can help you, perhaps with a mood assessment and practical suggestions for coping strategies. If you experience ongoing depression, you may need treatment (see pp.176–179).

Letting your family and friends help can ease the stress of dealing with a new baby and managing your diabetes

If you are already having treatment for a preexisting mental health or emotional problem, or another health condition in addition to your diabetes, these need to be reassessed. It may be necessary for your diabetes treatment to be adjusted.

▷ **A new life**
Adjusting to life with a new baby can be exhausting. You may need to make adjustments to your diabetes routine while you adapt.

Benefiting from health care

When you have diabetes, regular health checks are an integral part of life, with several routine appointments a year, plus extra ones if required, and an annual physical. You and your healthcare professionals are partners in your care, and these consultations provide an opportunity to review your diabetes management and health, and also to keep you informed about new developments.

Routine appointments

You will be invited for several routine appointments every year with your diabetes health professionals, typically three but sometimes more. You may also request additional consultations if you feel you need them.

A routine appointment usually includes measurements of your blood glucose and A1c levels (see p.31) and other medical checks in the care plan from your annual physical. Your weight will also be taken. Otherwise, the appointments are focused on how you are managing your life with diabetes and any problems you may be having. The appointments can not only help you to manage your diabetes, they also provide an opportunity to ask questions, build a relationship with your health professional, and broaden your knowledge—perhaps by finding out about new pieces of equipment, diabetes support groups, or research projects.

Annual physical

At least once a year you should have an appointment with your primary care provider or diabetes specialist. This is your main overall diabetes health check, and it covers the physical, psychological, and educational aspects of the condition. Your health professionals will check your health, offer treatment, and make any necessary referrals to other specialists.

◁ **Obtaining a blood sample**
As part of your regular checks, you will have blood taken from a vein in your arm, in order to get a large enough sample for several different tests. This may happen before or during your appointment.

KEEPING UP TO DATE

Being well-informed about new developments helps you take an active part in the care you are offered. Some ways you can do this are:

- Signing up for online updates from national diabetes associations.
- Making contact with other people living with diabetes for peer support.
- Regularly checking for news and updates from the manufacturers of your insulin, medication, and diabetes equipment.

They will also help you with any concerns you may have about any aspect of your diabetes, and it can be useful if you prepare for your review by making a list of these beforehand. If you have the results of recent lab tests or any other health checkups, the annual physical provides an opportunity to discuss the results with your diabetes healthcare professionals.

Your annual physical may take place in a single session or over several sessions. In addition to medical checks, your health professional will ask about your general health, such as whether you smoke, drink alcohol, and if you have any diabetes-related health issues, such as urinary problems (see pp.184–187) or sexual dysfunction (see p.201). Your appointment will also include discussions about how you feel you are managing your life with diabetes, such as:

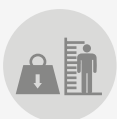
- Whether you feel distressed, burned out, or depressed by diabetes (see pp.110–111 and pp.176–179) and if you need psychological support.
- How you are coping with food and eating and how to obtain individual support from a specialist dietitian.
- Whether you are planning to become pregnant and, if so, how to prepare for it.

ANNUAL PHYSICAL MEDICAL CHECKS

Blood tests to measure levels of lipids (cholesterol and fats), glucose, and A1c (see p.31).

Blood and urine tests to check the functioning of your kidneys.

Blood pressure measurement, as part of the assessment of your heart and circulation.



Height and weight measurement to calculate your body mass index, and waist measurement (see pp.92–93).

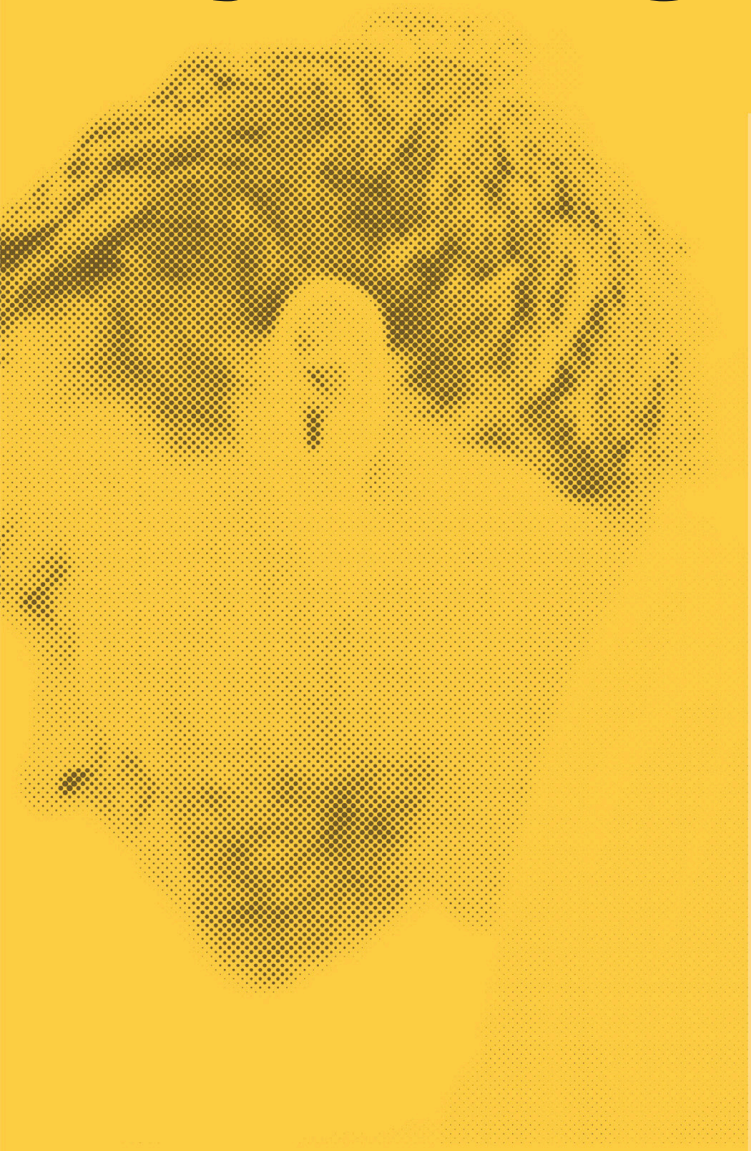
Examining your feet and legs to assess blood circulation and nerve function, as checks for early signs of peripheral ischemia or peripheral neuropathy (see pp.188–190).

Imaging of the retina at the back of your eyes to check for any changes that may indicate retinopathy (see pp.180–181).

If you use injected medication, checking your injection sites for buildup of fatty deposits in your skin (see lipohypertrophy, p.198).

As a result of your annual physical, you and your health professional will decide on a care plan for your diabetes, including any agreed changes to your existing regimen, any new medication, further appointments, any medical checks for your routine appointments, and contact details of who you can ask for advice or support. You may also be invited to attend a diabetes education session or event. You and your health professional will have a written copy of the plan, so everything is documented.

Children and young people



Babies and young children

Caring for a child with diabetes places many demands on you as a parent. You need to manage their insulin, blood glucose, and healthy eating, as well as deal with low blood glucose. Getting support and learning how to deal with the emotional impact of diabetes can help.

Your child's diagnosis

It is rare for children under five to develop diabetes, but type 1 diabetes can occur in babies and toddlers. The symptoms of diabetes, such as passing a lot of urine and being very thirsty, are the same in children under five as in adults. Symptoms can become apparent very quickly—over just a few days or a week. Once your child has been diagnosed with diabetes, you will be offered support, advice, and routine checkups from your health professional and diabetes team.

INFORMING YOUR CHILD'S CARERS

You need to make sure that anyone who looks after your child is given enough information about your child's diabetes. You can ask your health professional to help you provide this.

- Explain what diabetes means, and specifically what treatments and blood glucose checks your child needs and when.
- If carers need to give injections or check your child's blood glucose, show exactly what is involved. You may need to repeat the information regularly before it becomes familiar.
- Tell carers about your child's eating and drinking requirements (see p.148–149) and why these are important.
- Explain what symptoms might suggest your child is having low blood glucose (see pp.62–65), and what they need to do to treat one (see pp.154–155).
- Explain the symptoms of hyperglycemia (see pp.68–69).
- Tell carers what they should do if your child is not feeling well—in particular, if your child is vomiting.

Learning about diabetes and emotional impact

When your baby or young child is first diagnosed with diabetes, you are likely to experience various emotions—anger, guilt, anxiety, and sadness, for example. You may worry whether you will be able to cope with the level of care your child will need every day. You will be responsible for looking after all aspects of their diabetes care, which can make your job as a parent even more demanding. Your child needs food at regular intervals, blood checks, and insulin injections. They might not yet be able to tell you how they feel, so it is also your job to make sure that their blood glucose does not fall to a level at which they have low blood glucose (see pp.62–65; 154–155).

However, you are not alone. With the support of diabetes professionals, you will quickly learn more about diabetes and what you need to do to take care of your child. As well as routine appointments at a diabetes clinic, diabetes health professionals will also discuss your child's growth and development with you. Aiming for a fasting blood glucose level of 80–130 mg/dl is generally recommended to keep your child healthy as they grow older; however, check with your child's doctor about individualized targets.

Talking to friends and family

Your family and friends will probably be concerned about your child's diabetes, and they will almost certainly want to know more about it. It's up to you to decide how much to say and to whom, but you will need to give more detailed information to people who care for your child, such as nursery school or daycare staff, or babysitters (see opposite). You will find they respond in a variety of ways.

People who are close to you may be upset and unsure how to treat your child. You may find it difficult to support and reassure others when it is all new to you too, but it is important to try to help people understand what you are going through and to appreciate how they are feeling, too. If you have other children, make sure they are included so they don't feel left out. You may need to spend time with them to answer any questions they have about diabetes and any worries they have about their brother or sister.

Try to help people to understand what you are going through, and appreciate how they are feeling, too

◁ **Happy times**
Having a young child with diabetes is likely to put extra pressure on your role as a parent, but you can still enjoy lots of different activities together despite its demands.

◁ **Healthy meals**
Encourage your child to eat a variety of foods. It is important to provide some complex carbohydrates, such as whole-grain bread, rice, pasta, or potatoes at each meal.

Babies and young children:
What to eat and drink

Introducing regular food and mealtime routines for your young child will help with their diabetes. As babies move from milk to solids, you can start to introduce a variety of foods, especially carbohydrates, needed to balance blood glucose and avoid low blood glucose (see pp.154–155).

SUPERVISING YOUR CHILD'S FOOD INTAKE

- Mealtimes are important for social as well as for nutritional reasons—avoid conflicts about food.
- Don't worry if your child doesn't eat healthy food at every meal—it's the overall balance that matters.
- If you're having problems, talk with your health professional about ways of matching your child's insulin to their current eating pattern.

Introducing different foods and beverages

Your young child needs a variety of foods to ensure that they grow and develop healthily. If you are breastfeeding, feeding on demand will help to fulfil your baby's nutritional needs, although you may need to supplement breast milk with bottle feeding if your baby's blood glucose becomes low. If low or high blood glucose is a frequent problem, adjusting your baby's insulin dose will be helpful.

As you introduce your child to more foods, you will need to include those that contain carbohydrates such as whole-grain bread, pasta, rice, noodles, and potatoes. Your child will need to eat enough carbohydrates at mealtimes and throughout the day to keep the blood glucose level in their target range and avoid hypoglycemia. Snacks could include yogurt, cereal bars, or fruit.

You won't do your child any harm if some meals are less healthy than others. As with all children, it is the overall food intake that matters.

Food refusal and dislikes

Your child may be choosy about food at times, and their eating pattern may vary a lot. This can be frustrating when you want to encourage your child to eat in order to keep their blood glucose in the recommended range. If your child refuses food, keep calm. It is okay to give mealtime insulin just after the meal to match the carbohydrate intake of the foods your child has actually eaten.

Make sure your child has regular carbohydrate-rich foods to keep blood glucose in the target range

Bedtime snacks

Make sure that your child has eaten enough food in the evening to keep their blood glucose from falling overnight, especially if they usually sleep through until morning. If you don't think your child has eaten enough, and you can't fit in a snack for them before bedtime, you may need to check their blood glucose later in the evening. If it is too low, give your child a drink or snack that's quick and easy to eat. If low or raised blood glucose becomes a regular event, you will need to reduce or increase your child's insulin dose. As your child grows older, and the time between their evening meal and bedtime gets longer, it will become easier to assess what they will need during the night.

Eating out

There is no reason why you shouldn't eat out as a family when your child has diabetes, whether at a restaurant or a friend's house. Fast food, takeout, and party food can all fit, as well as being enjoyable treats on these occasions.

If you are not sure what food will be available or when, it can be useful to pack an emergency supply of foods you know your child will eat. In addition, include glucose or another fast-acting carbohydrate source for immediate treatment of low blood glucose, and longer-acting carbohydrate-containing food to maintain the raised blood glucose afterward.

Babies and young children:
Blood glucose management

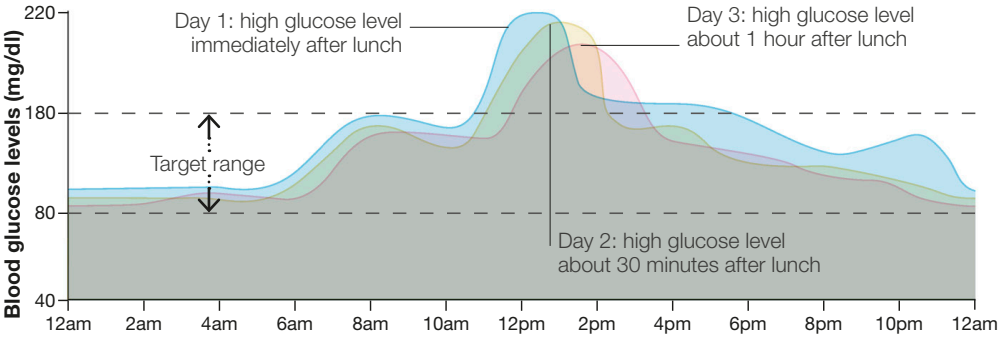
Taking good care of your child's blood glucose is essential right from the start: what you do now could make a difference to their future health as an adult and reduce the risk of long-term complications. Blood glucose management is also important for their healthy growth, development, and well-being.

Target blood glucose levels

Managing your child's diabetes may be challenging and emotional. It's okay to acknowledge that you might not always get things right or keep their blood glucose levels in target range. Every child is different, so talk with your child's health professional to determine the best targets for your child. Keeping close track of your child's blood glucose will help you identify patterns and learn what action to take.

Checking your child's blood glucose level and giving insulin may be difficult, especially at first. However, to manage your child's diabetes as effectively as possible, you will need to monitor their blood glucose regularly before and/or after meals and at least five times a day (if you use a traditional blood glucose meter). This allows you to adjust your child's diabetes treatment, activity, or food intake according to the results.

▷ **Checking your child's blood glucose**
When checking your child's blood glucose it is helpful to stay relaxed, do the check as efficiently as possible, and then resume what you were both doing.



△ **Blood glucose patterns**
The pattern of your child's blood glucose levels over several days can help you to identify recurring highs or lows and take appropriate action. For example, repeated highs after lunch, may indicate that you should review their morning activity, food, or insulin..

Identifying patterns

Changes you make to your child's diabetes medication, activity, or food intake are best based on a pattern of blood glucose results rather than a single one. For example, higher blood glucose levels occurring at the same time on several consecutive days is a pattern, so you can try to find a cause and take the appropriate action. If there isn't an obvious reason for higher or lower levels, your child may need an adjustment to their insulin dose (see pp.48–51). Continuing to check their blood glucose will show you how well a change has worked.

If your child has a high blood glucose level, try to avoid allowing this to continue for more than a few days (even if they seem well), because this could increase the chance of your child developing symptoms (see pp.68–69), becoming prone to infection, or starting to produce ketones (see p.71).

Blood glucose management also entails keeping your child's blood glucose level above 70 mg/dl in order to avoid hypoglycemia. However, if your child is hypoglycemic, you should take immediate action (see pp.154–155).

As your child grows older, bigger, and takes part in new activities, you will probably need to adjust how their diabetes is managed; they may need a different type of insulin or insulin regimen (see pp.44–47), or adjustments to their food, or both. Your diabetes health professional will be able to give advice that is tailored to support you and your child's needs.

Keeping track of your child's blood glucose will help you learn patterns and courses of action

MANAGING YOUR CHILD'S BLOOD GLUCOSE

- Use trends and patterns in your child's blood glucose levels to guide you rather than responding to each individual reading. However, a <70mg/dl reading indicates hypoglycemia and requires immediate action.
- Link up with other families with children who have diabetes online or in person for emotional and practical support.
- Keep up to date with new technology that can help you to manage your child's diabetes, such as continuous glucose monitors and insulin pumps.
- Use appointments with your diabetes health professional to ask questions, discuss worries, and find out the latest information.

Babies and young children:
Blood glucose and insulin

Although you might find it difficult to inject your baby or young child every day, they need insulin to live, and blood glucose checks will always be part of their everyday life. Keeping blood glucose levels in the recommended range is essential from whenever your child is diagnosed and is associated with better health in later life.

Insulin dose and timing

The exact times you monitor your child's blood glucose and give insulin each day will vary but will tend to follow a general pattern. For example, your child will need an insulin injection or dose around one or more of their mealtimes, and blood glucose checks either just before or 2 hours after meals.

The doses of insulin you need to give will vary over time. Many children with type 1 diabetes will go through a period, from a few months up to a year, during which they may only need small amounts of insulin. Once this period is over, your child will need more insulin.

You may need to increase your child's insulin dose frequently when they have a growth spurt. You may also need to try different insulins and regimens from time to time to find one that best suits your child at their particular stage of development. Adjusting your child's insulin is an integral part of learning to live with diabetes, and your health professional will help you with this.

How to inject insulin

Before giving your child an insulin injection, make sure you wash your hands and have everything you need ready. Try to stay calm and don't rush.

- If you are using an insulin pen, attach a needle. If you are using an insulin syringe, have the insulin vial ready.
- Before injecting: with an insulin pen, do a 2-unit air-shot, until insulin appears at the end of the needle; for a syringe, ensure there are no air bubbles.
- Make sure your child is sitting or being held comfortably; with an alcohol wipe, clean the injection site selected—usually the abdomen or hip/upper bottom—then inject using the technique you have been shown by your health professional.
- Keep the needle in the site for about 10 seconds and then withdraw it and set it aside in a safe place.
- After you've finished, comfort or distract your child.
- As soon as possible, safely dispose of the insulin pen needle (or syringe) in a sharps container.

You may need to increase your child's insulin dose frequently when they have a growth spurt

Coping with resistance

There will be times when your child is unwilling to have an injection or to have their blood glucose checked. Think about how you encourage them to take care of other aspects of their health, such as brushing their teeth, and try to incorporate diabetes care into their routine in the same way. Bear in mind that very young children may at first fiercely resist having an injection or blood glucose check but can be distracted easily immediately afterward. Even if you sometimes feel guilty about giving your child an injection or doing a blood check when they are upset, consider the impact of any kind of reward you give afterward. Cuddling, reading a book, or playing with a favorite toy together can help your child to associate injection or blood monitoring time with a pleasurable experience, but rewards, such as new activities, new toys, or even food, can be difficult to deliver every day.

MONITORING OR INJECTING A RELUCTANT CHILD

- Explain what you are going to do and then do it immediately. Don't say that you'll do something "in 5 minutes"—this will increase any sense of anxiety.
- Hold your child securely on your knee as you do a blood glucose check or give an injection.
- Ask other family members to help if necessary.
- Allow your child to help if they want to (and are old enough).
- Cuddle and praise your child when the check or injection is finished.

▽ **Injecting insulin**
When injecting your child with insulin, it is important to change sites regularly to avoid potential problems with absorption.

Babies and young children:
Dealing with hypoglycemia

Hypoglycemia is a side effect of insulin treatment, so your child will have an episode from time to time, even if you are achieving targeted blood glucose levels. However, if you are alert to signs of hypoglycemia, you will be able to act quickly to help your child recover.

Recognizing warning signs

The signs of hypoglycemia are individual for each child, but they tend to be similar each time so you will soon learn what they are. You also need to be aware that your child could have severe hypoglycemia if they:

- Have been very physically active but haven't taken less insulin or more food to compensate.
- Eat less than usual.
- Have had a recent increase in their dose of insulin.
- Become overheated.
- Are unwell, especially with vomiting.

A blood glucose check will confirm whether or not your child's blood glucose has fallen below 70 mg/dl, which means that they are hypoglycemic. If you can't check and think your child is hypoglycemic, it won't do any harm to give your baby a breastfeed or bottle feed, or your young child glucose or a sugary drink to raise their blood glucose. The sooner you treat hypoglycemia, the sooner your child will recover.

A blood glucose check will tell you if your child is having an episode of hypoglycemia

GET EMERGENCY MEDICAL HELP

- If treatment (see below and opposite) isn't working and your child continues to be hypoglycemic.
- If your child becomes unconscious and there is nobody who has been shown how to inject glucagon or a glucagon kit is not available.
- If your child has difficulty breathing.
- If your child has a seizure. Do not restrain them but ensure they can't injure themselves.

Treating hypoglycemia

Because hypoglycemia can be unpredictable, it's useful to keep glucose pills or gel, or a sugary drink, handy to treat it. You can also limit the risk of hypoglycemia by giving your child a carbohydrate snack at bedtime, or waking them for a snack during the night if their blood glucose is dropping. During the day, regular meals and snacks will help to balance insulin doses. If your child eats much less than usual at mealtime you may need to reduce their next dose of insulin.

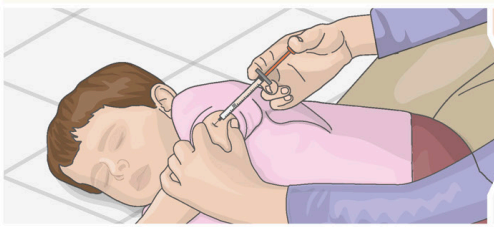
If you know that your child will be particularly active, you can give them more to eat or a reduced insulin dose beforehand. Extra activity can cause your child's blood glucose to fall several hours later, so you can give your child extra food after the activity to compensate.

TREATING SEVERE HYPOGLYCEMIA

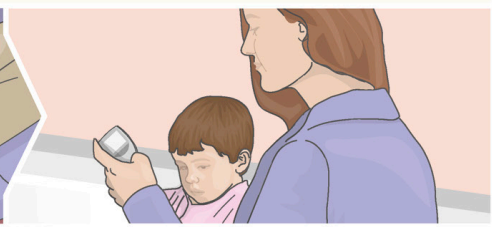
If severe hypoglycemia is untreated, there is a risk that your child could become unconscious or have a seizure. If your child does have a seizure, it doesn't mean that they have epilepsy; it is the brain's reaction to a low glucose level. Keeping calm and taking the following measures will help your child recover.

1 If your child is having a seizure, make sure their mouth is clear so that they can breathe. Ensure that they can't injure themselves and get emergency help.

2 If your child can breathe normally, lay them on their side or hold them with their head tilted back slightly to keep their airway clear.



3 Prepare a glucagon injection or nasal powder (see p.67), or ask someone else to do so, and give it to your child as directed. Don't try to give them anything to eat or drink.



4 When your child has regained consciousness, they might vomit as a result of the glucagon. Sit your child up and check their blood glucose as soon as it is practical to do so.

5 When your child is more alert, give them food or something to drink that contains carbohydrates to keep their blood glucose level in target range.

6 Check your child's blood glucose level every 30 minutes until it is above 70 mg/dl and you are confident that they have recovered completely.

School-age children

Whether your child has recently been diagnosed with diabetes or has lived with it from a young age, their earlier school years—between the ages of about 5 and 12—are a time of growing independence. They will understand more and can gradually learn to manage their diabetes themselves. However, support from you and your child's teachers is still essential so that your child can maintain good diabetes management and participate fully in all activities.

Diabetes, your child, and you

If your child already has diabetes when they reach school age, it is probably type 1 diabetes (see pp.12–13) and you will be giving them insulin. You will notice that their insulin requirement increases as they grow, and that you will also need to adjust the dosage more often in response to new activities at school or changes in the times at which they eat. If your child develops diabetes during their early school years, it is most likely to be type 1, although it may be type 2 (see pp.14–15) or MODY (maturity onset diabetes of the young, see pp.16–17), which, although still relatively rare, are becoming increasingly common in school-age children.

As a parent, it is important to balance caring for your child's diabetes and encouraging them to understand and manage it themselves without allowing the condition to dominate all your lives. Striking this balance can be challenging, but talking to your health professionals, helplines and online support groups, and particularly other parents of children with diabetes, can be useful not only for practical advice, but also for reassurance and psychological support.

Telling other people

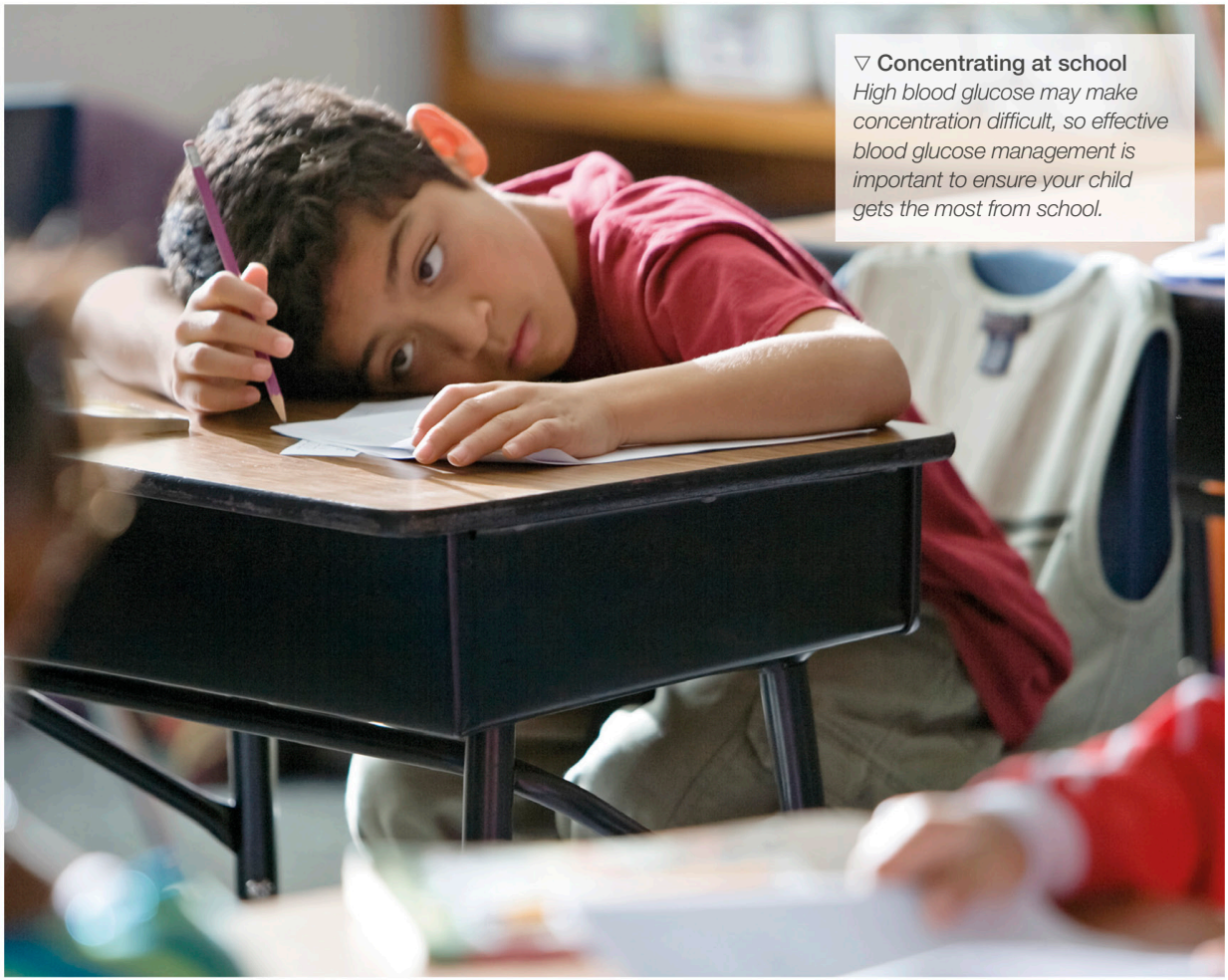
In general, it is your decision who and how to tell other people about your child's diabetes. If their diagnosis is recent, you may want to inform others gradually as you become increasingly confident in dealing with the situation. Your relatives and close friends are likely to be the first people you tell, and they can be a valuable source of support for you and your child.

The main people who need to know about your child's diabetes are those who are directly involved in their care, such as your child's sitter or school staff.

INVOLVING YOUR CHILD IN THEIR DIABETES

The following suggestions may help your child to understand their diabetes and become more actively engaged in managing it.

- Try to respond to any questions your child has about their diabetes as clearly and simply as you can.
- Be positive about any attempts your child makes to help with their diabetes, such as dialing the dose on an insulin pen.
- As your child gets older, encourage them to look at websites, apps, and books about diabetes, and allow them to choose suitable equipment that appeals to them.
- Your child's enthusiasm for managing their diabetes may come and go, so you should be prepared to take over if your child becomes reluctant to care for their diabetes themselves.



▽ **Concentrating at school**
High blood glucose may make concentration difficult, so effective blood glucose management is important to ensure your child gets the most from school.

They will need to learn how your child's diabetes is managed, and also how to identify and respond to both low blood glucose levels (hypoglycemia, see pp.164–165) and raised levels (hyperglycemia, see pp.68–71), including giving emergency treatment and details of whom to contact. The more information you can provide, the more confident other people will be in looking after your child. Your health professionals will be able to help you to advise and train caregivers and school staff about what to do for all activities and in all situations, such as school outings, and will also provide written guides and information.

A child with diabetes can do anything other children do, but blood glucose management is important to keep them healthy

School-age children:
Meal-planning strategies

Trying to keep to healthy eating guidelines for your child with diabetes will help them stay well. If your child has type 2 diabetes, which is rare compared to type 1, you will receive specialized individual advice on how to manage their food and, if necessary, their weight.

Healthy eating principles

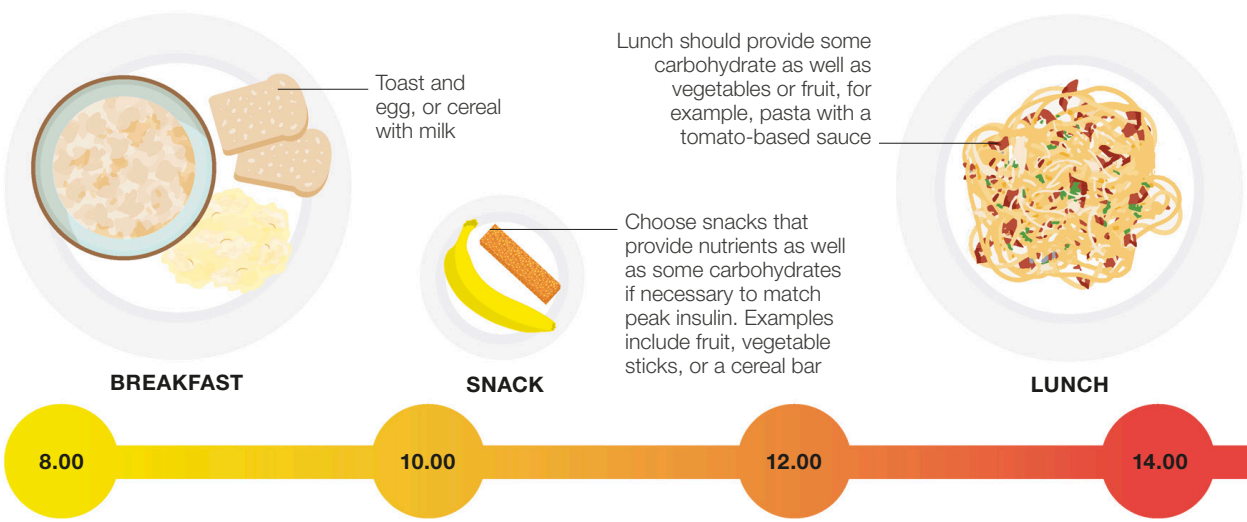
The general principles of healthy eating (see pp.74–75) apply as much to your child with type 1 or type 2 diabetes as every other child. They should have several portions of fruits and vegetables every day, plus quality carbohydrates, protein, and fat, and sugar and salt but in small quantities only. Having regular drinks of water or sugar-free fluids is also important.

Children tend to need three healthy meals and several snacks a day, in order to balance their insulin, prevent hypoglycemia, and ensure they grow and develop properly. Your health professional will offer information and support to help ensure that your child's food needs for their diabetes fit in with their overall health and well-being. They will also be able to help you be aware of the potential risk of eating difficulties (see p.179).

PLANNING EATING AT SCHOOL

You may need to ask the following questions to understand how best to plan your child's eating while at school:

- Are the children allowed to eat at break times?
- How often are breaks delayed?
- What time is lunch?
- When are sports classes and how often are there extra or unplanned physical activities?
- What are the general eating arrangements on school trips?
- When is there extra food, such as for birthdays or celebrations?



School and school trips

Your child can eat the same way as other children, either meals that are provided at school or a packed lunch. However, it's best to discuss the timings of meals with the school, and any possible variations in those timings, so that you can arrange your child's insulin doses and ways to prevent them from becoming hypoglycemic.

On school trips, when meals might be earlier or later than usual, your child will need a few extra snacks and hypoglycemia supplies in case of delays. It's worth reminding your child not to eat all their snacks at once and not to share them with friends. Before your child goes on a school trip, check the following:

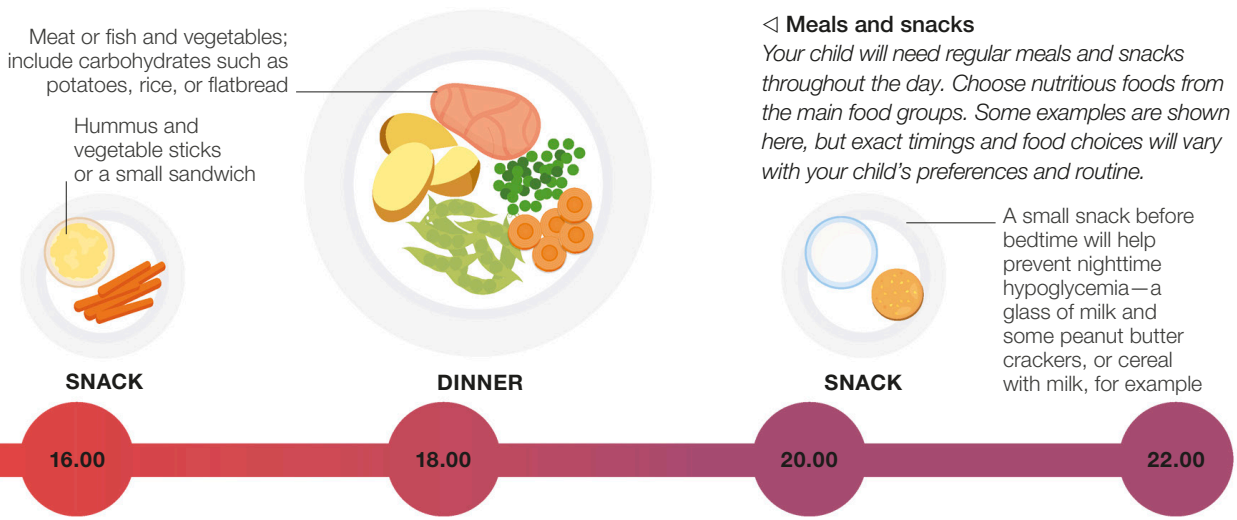
- The departure and return times and whether these are likely to be delayed.
- Arrangements for snacks and meals.
- The name of the person in charge, and whether they are your child's usual teacher or someone else. If possible, ask for the person's mobile phone number.
- Arrangements for contacting parents if a problem occurs.

HEALTHY SNACK AND LUNCH IDEAS

- ½ whole wheat bagels or sandwich wrap
- ½ English muffin with string cheese stick
- Chopped mango, apple, or kiwi fruit
- Wholegrain crackers or cereal bars
- Low-sugar, low-fat yogurt
- Carrot, celery, and pepper sticks and hummus
- Bowl of wholegrain cereal with milk

Eating out and parties

If eating out at a restaurant, a friend's house, or at a party is not a regular event, occasional extra carbohydrates, high-fat food, or a sugary treat on those occasions will not be harmful to your child. If their appetite or activity levels are unpredictable, you'll need to check their blood glucose afterward to see if they need an extra snack, or alternatively, a small extra dose of insulin to bring their blood glucose down if it has risen. If celebrations are a regular part of your family's life, it may help to talk with your health professionals about specific plans to manage your child's diabetes on those occasions (see pp.88–89).



◁ **Meals and snacks**

Your child will need regular meals and snacks throughout the day. Choose nutritious foods from the main food groups. Some examples are shown here, but exact timings and food choices will vary with your child's preferences and routine.

School-age children:
Blood glucose management

Making sure your child's blood glucose is managed effectively can be challenging as they grow up, spend time away from home at school, and become more independent. However, good blood glucose management is important for their everyday well-being and to reduce the risk of long-term complications.

Recommended blood glucose levels

Good management of your child's diabetes means aiming for a blood glucose range of 80–150 milligrams per deciliter (80–150 mg/dl) most of the time and an A1c level (see p.31) of about 7.5%. Maintaining these levels means checking your child's blood glucose regularly and considering their treatment, activity, or food intake according to their levels. Making adjustments based on the pattern of blood glucose readings is more useful than acting on each individual one (see pp.150–151).

Responding to changes

As your child develops, their routine, activity levels, and rate of growth will change, which will affect their blood glucose levels and their insulin needs. In practice, this means that your child's blood glucose readings won't always be within the ideal range. A week or two outside this range from time to time won't do any harm, but consistently high blood glucose increases your child's risk of health problems when they get older.

A slightly raised blood glucose level won't necessarily make your child feel any different. They will only have symptoms, such as thirst or tiredness, with a blood glucose level of 200 mg/dl or higher. On the other hand, if they are tired or upset for other reasons, this can be confused with hypoglycemia. It can be hard to figure out what to do without regular blood glucose checks, so it can be helpful to use a method that is quick and easy, such as continuous glucose monitoring (see p.37). This is also more comfortable for your child than the fingerstick method and can give you the information you need about the effect of any changes you have made to your child's insulin and/or food (see pp.48–51 for more about adjusting insulin doses).

When your child starts school, their diabetes management will need to be adjusted

MANAGING YOUR CHILD'S INSULIN TREATMENT

- If you can't predict how much or when your child will eat, an insulin pump or a different insulin regimen may be helpful.
- Keep in mind that it's the overall management of your child's diabetes that matters, not a single blood glucose reading.
- Make sure that your child hasn't had so many snacks that they can't eat at mealtimes. If you're worried about your child having a low blood glucose between meals or at school, you may need to adjust their insulin or medication doses instead.

▷ **Increased activity**
Your child is likely to do more physical activities when at school, which is good for their overall health but may require adjustments to their insulin regimen or dose, and/or their eating pattern.

School-age children: Blood glucose and insulin

Managing you child's blood glucose checks and insulin can be difficult, but there are ways of fitting them into the daily routine. Your health professional will be able to advise you about this and will also be able to help school staff with managing your child's diabetes.

Fitting diabetes into daily life

Insulin and blood glucose checks are an essential part of your child's life. Treating them like any other daily activity can help your child learn the importance of caring for their diabetes and preventing problems from occurring (see panel, opposite).

The practical processes of doing blood glucose checks and injecting insulin are similar to an adult (see pp.36–37 for checking blood glucose, and pp.56–57 for injecting insulin). In time, the practicalities of diabetes care will become an integral part of your child's daily routine. However, like other routine daily activities, such as brushing teeth or handwashing, sometimes an

◁ **Helping your child become involved**
Supporting your child in choosing a new item of diabetes equipment, such as a blood glucose meter, continuous glucose meter (CGM), or insulin pump, can encourage them to become involved in their diabetes.

aspect of diabetes care may be overlooked or done later than usual. It is important to accept that this will happen from time to time and to realize that it is the overall management of your child's diabetes that is most important, rather than any single event. Keeping this in mind and passing it on to your child can help them to develop a healthy perspective on their diabetes as they grow older.

Important considerations in managing your child's diabetes are to try to avoid hypoglycemia and to take prompt action when it does occur (see pp.164–165). The possibility of your child having low blood glucose can be worrying, especially when they are away from you, doing something new, or at night. Talking over your concerns with your health professional will help to make sure you have all the information you need to avoid and deal with hypoglycemia.

Involving your child

You will know the best time to start involving your child in their own diabetes care. In general, involving them as much as possible in, for example, figuring out what their blood glucose levels mean and what changes you need to make to their insulin (or other medication if they have type 2 diabetes or MODY), activity, or food, will help them with taking responsibility in the longer term. There will be times when your child is not interested, reluctant, or wants to change the timings of checks or injections. Thinking in advance about these situations and discussing them with your health professionals and other parents will help you to find ways of dealing with them when they do occur.

As your child gets older, you can start to involve them in their diabetes care

Involving your child's school

Your child may need to have blood glucose checks and insulin at school, so you will need to discuss with school staff and your health professional how these can be managed successfully. For example, it may be necessary to train school staff how to handle these procedures. When your child is old enough and feels confident, they will be able to manage their monitoring and insulin themselves, although they may still need support from school staff.

In turn, teachers and other staff will be able to give you information about how your child is coping at school, so together you can find ways to encourage them or address any difficulties your child is experiencing.

PREVENTING PROBLEMS

- Injecting insulin constantly in the same site causes lumps, called lipohypertrophy, and also means that insulin is not absorbed properly. Change the injection (or infusion) site regularly and teach your child how to do this themselves.
- Continuous glucose monitoring provides more readings without fingersticks. You can also set low blood glucose alerts and send them to your phone so you know how your child is doing throughout the day.
- If your child has or develops fears about injections, blood glucose monitoring, or anything diabetes-related, take these seriously and explore them, with the help of your health professionals, if necessary.

School-age children:
Dealing with hypoglycemia

When your child starts school, they will be in a new environment and have a new routine. You will naturally be concerned about the possibility of them having hypoglycemia when you are not there, but you can help to reduce this worry by making sure that your child and the school staff know how to recognize the signs of hypoglycemia and, if your child does have it, how to treat it quickly and effectively.

Recognizing hypoglycemia in a school-age child

The indications that your child is hypoglycemic—a blood glucose level below 70 milligrams per deciliter (mg/dl)—are individual to each child, but will be familiar to you as the child's parent. Encouraging your child to recognize the signs of hypoglycemia themselves and to ask for help before it becomes worse is a good start. Sometimes, however, your child will be unaware of the signs or can't say how they feel, so their teachers or activity staff also need to be aware of your child's individual signs. Ideally, a blood glucose check will be done to confirm hypoglycemia, but if it isn't possible to do a check, it won't do any harm to treat what seems to be hypoglycemia right away. Your health professional can help with teaching the school staff about hypoglycemia and how to deal with it.

POSSIBLE SIGNS OF HYPOGLYCEMIA IN A SCHOOL-AGE CHILD

Although the specific pattern of signs varies from child to child, signs tend to be similar for a particular child. A detailed list of possible signs and symptoms is given on pp.64–65; however, common signs of hypoglycemia in a school-age child may include:

- Unusual moodiness or behavior change, such as crying for no reason or silence
- Difficulty concentrating
- Sleepiness
- Loss of coordination
- Sweating
- Paler than normal skin

Treating hypoglycemia in a school-age child

The treatment for hypoglycemia in a school-age child is similar to that for an adult (see pp.66–67). In the early stages, hypoglycemia can usually be treated effectively by giving your child something to eat or drink that contains glucose. When your child is old enough, teach them to carry a source of fast-acting carbohydrate or glucose at all times to eat it as soon as they recognize their hypoglycemia signs.

If hypoglycemia becomes more severe, your child cannot swallow, or they lose consciousness, they will need to be given a glucagon injection to raise their blood glucose. Glucagon is now also available as a dry nasal spray that is easy to administer. Glucagon will need to be given by you or a trained school staff member. If no trained personnel are available, call 911 immediately.

Avoiding hypoglycemia

Although you will want to protect your child against hypoglycemia, try to avoid the temptation to keep their blood glucose consistently high (above 180 mg/dl) in an effort to prevent them. This tends not to be a reliable way of avoiding hypoglycemia, because insulin levels in your child's blood and the amount of energy they use may vary a lot during the day. In addition, a high blood glucose level can produce unpleasant symptoms as well as put your child at risk of health complications in the future.

Hypoglycemia can also occur some time after your child has been physically active, as the muscles replace the energy they have used by taking glucose from the bloodstream, and because your child's insulin will still be working. It's important that your child is active because of the health benefits of exercise, so to reduce the risk of hypoglygemia, try changing the time of your child's insulin injection or reducing their dose before any planned activity. If their activity is unplanned, give your child an extra carbohydrate snack afterward. If the activity lasts longer than an hour, your child may need extra glucose in the form of a sugary drink or sweets during the activity, too.

GET EMERGENCY MEDICAL HELP

- If the treatment for hypoglycemia (see pp.66–67) isn't working and your child continues to be hypoglycemic.
- If your child loses consciousness and there is nobody to inject glucagon or a glucagon kit is not available.
- If you child has difficulty breathing.
- If your child has a seizure.

▽ **Treating hypoglycemia early**
It is often possible to prevent your child's hypoglycemia from becoming more severe by giving them something high in sugar to eat or drink, such as 4 oz. of fruit juice or regular soda, or 3 to 4 glucose tablets.

Teenagers and young adults

Adolescence is a time of change and challenge: a teenager with diabetes not only has friendships, exams, the effects of hormones, and growing independence to deal with, but also blood glucose management. As a parent, you want to be supportive of your teenager and help them to cope with feelings, as well as assist with diabetes management skills that suit your family's lifestyle.

Diabetes, your teenager, and you

Having diabetes can complicate your teenager's life and cause you worry as a parent, but there are ways of working together to reduce any stress. As a parent, you may be tempted to try to be in control of your teenager's diabetes, but seeing it as their condition and increasing their responsibility for it can be a more supportive and successful strategy. Teenagers still need, and tend to respond to, rules and boundaries, even though they might argue about them. Being firm and consistent, and treating diabetes care as you would any other aspect of your teenager's life, may help. For example, you might agree that your teenager performs a certain number of blood checks per day or that they attend clinic visits regularly. The more you involve your teenager in making decisions that affect them, the more likely it is that they will achieve what has been agreed.

How teenagers treat their diabetes varies, but it is likely to be similar to the way in which they treat other aspects of their lives. A teenager who is doing anything that is important in managing their diabetes is likely to respond well to praise and encouragement. However, they may also see their diabetes as setting them apart from their friends and so try to make it less obvious by ignoring it or doing little in the way of monitoring or eating healthy. If you are worried that your teenager is not doing enough to manage their diabetes and none of your suggestions seems to work, they may be more receptive to friends or other family members, so ask for support from anyone you think will help. You can also contact your diabetes health professional for teenagers and young adults.

INTERACTING WITH YOUR TEENAGER

- Help your teenager plan how to look after their diabetes in every kind of situation.
- Encourage your teenager to come up with their own solutions to problems with diabetes management – they will learn more by experimenting than by simply following instructions.
- Remind your teenager often that you respect, love, and support them.
- Try to allow your teenager to join in with what their friends are doing.
- Try to say "yes" rather than refuse on account of your teenager's diabetes.
- When you ask questions about your teenager's diabetes, try to make it part of an ongoing conversation rather than the sole focus.
- Listen calmly to anything they say.

△ **Talking to your teenager**
Good communication involves listening as well as talking, so it is important to give your teenager time to talk. Even if you have disagreements or arguments, it helps to remain calm and to keep lines of communication open.

Changing diabetes management

Diabetes management for teenagers with type 1 or type 2 diabetes, or MODY (see pp.16–17) is personalized for each individual and will need to change as they grow and develop, and as their circumstances change. For example, it is likely that the effect of hormones will increase the amount of insulin a teenager with type 1 diabetes needs as they go through adolescence. In addition, the pressures of exams or starting work, developing sexually, and possibly experimenting with alcohol or drugs will also affect their blood glucose.

As a result, regular blood glucose monitoring and contact with your teenager's diabetes health professional are crucial to ensure that their diabetes is managed effectively. The health professional can also advise about new technology that may make it easier for your teenager to manage their diabetes.

Good management of your teenager's diabetes is important to keep them healthy and help avoid complications in the future

Teenagers and young adults:
Dealing with your feelings

When you have diabetes as a young person, you may experience a range of feelings, both positive and negative. If you have constant negative feelings, your healthcare professional can help. Some of the best people to understand your situation are other diabetics; both in-person and online peer support can be reassuring.

Your feelings about diabetes

However long you have had diabetes and whatever type you have, you will have a range of feelings at different times, from positive, such as acceptance or feeling motivated, to negative, for example, anger, resentment, guilt, or even embarrassment. It's important to know that these are to be expected, because diabetes is a difficult and demanding condition that can sometimes seriously disrupt your life.

If stress related to your diabetes becomes an issue from time to time, try using coping strategies (see opposite). However, if you have constant negative feelings that make you avoid caring for your diabetes, you should share this with someone, such as your parents or a close relative, a friend's parent, a diabetes health professional or helpline, or anyone with whom you feel comfortable, so they can help you.

GET EMERGENCY MEDICAL HELP

- If you are persistently depressed, tearful, or anxious and/or withdraw from or avoid social interactions.
- If you are becoming anxious about food and eating and are avoiding your diabetes management.
- If you are having thoughts of harming yourself or somebody else.

Your friends and your feelings

You may be concerned that your friends will think differently about you if you tell them you have diabetes. You may even experience people being unkind simply because of your diabetes, which may make you not want to tell others or ignore your diabetes. If you do want to tell a friend, thinking about what to say in advance can help to make it easier. Your real friends will be genuinely interested, accepting, and supportive. If you are being bullied or hassled by anyone at school, college, or work because of your diabetes, it is important to report this to a teacher, tutor, or employer.

Peer support

Support from other young people with diabetes is one of the best ways to help you feel you are not alone or different and that you can cope with your diabetes. Meeting others in a similar situation means that you can share the experiences, ups and downs of life with diabetes, and practical ways of dealing with challenges. Your local area may have face-to-face activities or diabetes

education classes that bring you together, and there are also many online and social media forums, discussions, and events to participate in. As well as providing practical help and support, these events are also an opportunity to meet people and make new friends.

Mental health

Diabetes may sometimes cause specific psychological issues, such as diabetes-related distress and burnout (see p.111) or diabetes-specific fear of hypoglycemia (see p.176). Your diabetes health professionals will be able to identify these problems and offer help. However, you may already have a mental health condition when you are diagnosed with diabetes, or you may develop one after diagnosis. Your treatment for these additional conditions will continue or be the same as for anyone else, and, if necessary, your diabetes management will be adjusted. It can be difficult to manage more than one condition, and you will be offered extra emotional support and practical help.

Support from other young people with diabetes can help you feel that you can cope with your diabetes

Talk with or message other people with diabetes. Sometimes, simply sharing your feelings with others in the same situation can help to reduce your stress.

Try to exercise regularly. This will not only benefit your physical health but can also help lift your spirits when you're feeling down.

Listen to music or podcasts, watch videos, or visit websites you find uplifting and enjoyable.

Remind yourself that having diabetes is not your fault and that you are doing your best. You may find it helpful to list your positive achievements in caring for your diabetes.

Think about refreshing the way you manage your diabetes, perhaps by using an insulin pump, a different insulin regimen, or a new form of blood glucose monitoring.

Talk with your health professional. This is especially important if other measures haven't worked or if you are experiencing persistent negative thoughts or feelings.

△ **Dealing with diabetes stress**
Occasional periods of diabetes stress are normal and you can often deal with them effectively by using one or more of the coping strategies outlined above.

△ **Long study periods**
When you are studying, it can be easy to forget to take your medication or eat. Setting up a reminder on your smartphone or watch can be useful to ensure that you don't miss food or medication times.

Teenagers and young adults:
Getting on with your life

There are few things you cannot do with diabetes. Modern, flexible treatment regimens and new technology have made it easier to manage your diabetes so that can fit in with your life. As a young adult, you will take more responsibility for managing your diabetes yourself, but your health professionals will help so you can do this successfully and with the least inconvenience.

Your diabetes care

If you were a child when first diagnosed, as a teenager you will be offered a transition service (known as young adult care) between the child and adult diabetes care services. If you were already a young adult when diagnosed, you will probably enter the adult service directly. However, there is no specific age at which you transition, it will depend on factors such as where you live and if you and your existing healthcare professionals think you are ready. Transitioning means learning to manage your diabetes independently, and the healthcare professionals will ensure you have the knowledge, skills, and equipment to do so successfully.

When you move to adult care, certain aspects of your diabetes care will change:

- Your healthcare professionals will be different.
- Your contact for emergency help between appointments will change.
- The time, location, and number of your diabetes healthcare appointments will change. You will transition to an adult endocrinology service from pediatric endocrinology care (see pp.142–143).
- Your recommended targets, such as your blood glucose levels and A1c (see p.31), might change.

You can continue to bring your parents or friends to appointments if you feel you need their support. However, your new healthcare professionals will talk to you directly about your diabetes.

If you have type 1 diabetes, you will need to take insulin (see pp.42–51). If you have type 2 diabetes or prediabetes, you may be taking pills (see pp.58–59) or insulin or a combination of both. For all types, you will need to check your blood glucose regularly (see pp.36–39).

The practicalities of looking after your diabetes may make you feel self-conscious or different from your friends but choosing the equipment or medication regimen that is right for you can often help. Your health professional will be able to offer advice so you can find the right solution for you personally.

Managing illness

An important aspect of starting to manage your diabetes yourself is learning how to deal with illness (see pp.124–125). This is because illness can make your blood glucose rise very high and put you at risk of potentially serious complications (see hyperglycemia, pp.68–71). Continuing to take your medication and getting medical advice sooner rather than later when you are ill will help to prevent your diabetes making you even more unwell.

School, study, and work

How you manage your diabetes at school, college, or at work will depend on your timetable or routine. As these change, you may need to change the type or timings of your medication, blood glucose monitoring, or eating patterns. Stressful times, such as exams or job interviews, are likely to make your blood glucose rise, and prolonged periods of studying or work may mean that you miss meals. Having your diabetes equipment and hypoglycemia remedies with you at all times is a good way to make sure you are well prepared.

As a young adult, you will learn how to manage your diabetes independently

If an organization has rules about eating, drinking, or medication that make your diabetes management difficult, your health professionals will be able to help you to resolve the issue. For example, they may be able to suggest adjusting your diabetes regimen to better fit your routine. They can also inform you of your legal situation regarding discrimination and diabetes.

Moving away from home

Leaving home involves a change of routine and responsibility, so it can be exciting but it may also cause you concern. If you are going to live independently, it is important to remember the following points:

- Get established with a local primary care provider, who can refer you to the specialist diabetes service for a new area. This will let you continue to get your prescriptions and ensure you have advice and help when you need them.
- If you are going away to study, you should let your college or university know that you have diabetes. They may be able to help with any arrangements you need.
- You will be completely responsible for your food. Make sure you have enough carbohydrate foods and hypoglycemia treatments for when you need them.
- If you share accommodations, keep hypoglycemia treatments in your room as well as in the kitchen.
- Tell a roommate or friend you see frequently about your diabetes and how to treat hypoglycemia (see pp.66–67) in case you're unable to treat yourself.

Going out, holidays, and travel

Some entertainment venues have restrictions on the type and size of items allowed, although these are often relaxed for medical equipment. Finding out your venue's policy and planning in advance of your visit—for example, by obtaining written confirmation of your diabetes

▽ **Attending events**
Your diabetes needn't mean you have to avoid events such as music concerts or festivals. However, you should make sure you take all the medication, food, and equipment you will need while there.

from your health professional—will ensure that nothing prevents you from enjoying yourself. It is also advisable to take your ID as proof of your age.

Having holidays with friends and even spending long periods traveling are all possible with the proper planning (see pp.116–117). Similarly, having diabetes will not prevent you from learning to drive and getting a license when you are old enough, although, depending on your diabetes and its management, you may have to inform the relevant authorities beforehand (see pp.114–115).

Drinking alcohol

Having diabetes doesn't mean you can't drink alcohol—when you're old enough to do so legally. However, alcohol can have extra effects because of your diabetes treatment, especially if you use insulin or insulin-stimulating medication (see pp.58–59). The main effects are that hypoglycemia symptoms may be similar to those of being drunk, so you may not be able to recognize and treat it effectively. In addition, your body cannot recover well from hypoglycemia when you have had a lot of alcohol, so hypoglycemia may be prolonged and severe, which can lead to you losing consciousness. (For more information about alcohol, see pp.86–87.)

Relationships and sex

When and how you tell your partner that you have diabetes is your decision. If you are sexually active, it is important to make your partner aware of your diabetes because sex is a form of physical activity and may affect your blood glucose level, potentially causing hypoglycemia. In a heterosexual relationship, using contraception when the female has diabetes is particularly important, unless you are planning a pregnancy, as their blood glucose at the time of conception has a large effect on the health of the developing baby (see pp.118–119).

SMOKING AND RECREATIONAL DRUGS

Smoking has a wide range of adverse health effects but it is particularly harmful for people with diabetes. Recreational drugs are also a particular health risk when you have diabetes.

Smoking

Having diabetes puts you at increased risk of heart and circulation problems, and smoking significantly increases this risk. The nicotine in tobacco smoke is also highly addictive. Smoking e-cigarettes (vaping) is commonly thought to be less harmful, but the fumes still contain nicotine and the safety of vaping has not been established. The best way to minimize the risk is not to start smoking or vaping. If you already do so, you can get support from health professionals to stop.

Drugs

Recreational drugs may be harmful in themselves. For people with diabetes, there is the additional risk that a drug may mask the effects of hypoglycemia and/or affect your alertness, which can make you forget to eat or take your diabetes medication. The safest course of action is simply to avoid taking any such substances.

Dealing with complications

Psychological problems

It is normal for diabetes to have an impact on you emotionally (see pp.110–111), but for some people the condition may lead to psychological problems, such as anxiety, depression, or specific fears. These may affect many areas of your everyday life, including how you manage your diabetes, which is why it is important to obtain professional help, if you feel you need it.

Fear of hypoglycemia

Many people with diabetes have episodes of hypoglycemia (low blood glucose, see pp.62–67) from time to time and deal with them without major issues. However, some people develop a severe fear of hypoglycemia and take unwise measures to avoid them. For example, they may reduce or even stop their diabetes medication so that their blood glucose remains high, which increases the risk of future physical complications. They may also check their blood glucose far more often than necessary. If you have an extreme fear of hypoglycemia, your health professional can help by discussing the problem and making a plan to reduce your fear. This might include a refresher course to help your confidence in dealing with hypoglycemia, or using a continuous glucose monitor so that you can set alarms to warn you before a low blood glucose reaction occurs.

Your health professional may also recommend behavioral health counseling, such as cognitive behavioral therapy (see opposite). You may need a combination of treatments to successfully reduce your fear of hypoglycemia.

SOURCES OF HELP

If you have a mental health concerns, there are many sources of help and support available, including:

- Your diabetes specialist health professional, who can provide information, practical help and encouragement, treatment, and refer you to specialized services.
- Diabetes organizations, online forums, and social media, which can give useful information about how other people with diabetes cope in situations similar to yours.
- Mental health organizations, which can provide information and peer support related to your particular problem.

Fear of physical complications

Being extremely worried about developing serious complications of diabetes can sometimes become overwhelming. Your fear might lead you to keep your blood glucose very low, putting you at risk of hypoglycemia or losing warning signs of them. You may become anxious about any rise in your blood glucose, even if it remains within your target range, or you may even feel it's not worth looking after

▷ **Discussing your issues**
It is important to be discuss any mental health concerns you have with your healthcare professional sooner rather than later so that together you can find a way to resolve them before they lead to more serious problems.

COGNITIVE BEHAVIORAL THERAPY
Commonly known as CBT, cognitive behavioral therapy helps you recognize and understand your distressing thought patterns and behavior and shows ways to consciously adopt more helpful thinking styles and behavior. When you take part in CBT, you will probably be asked to record your thoughts, feelings, and behavior. During a therapy session, these are analyzed to help identify inappropriate ones. The therapist will then help you to develop techniques for changing them.

your diabetes at all. Talking with your health professional is the first step to helping you with your fear. They will be able to give you information about how complications develop, give insight into your personal risk of complications, and give practical advice on how to reduce your risk. They can also help you to find ways of minimizing your fear and its impact on your life, such as getting support from family and friends, and, if necessary, can arrange for you to have specialized psychological therapy.

Concern about injections, fingersticks, or using insulin

You may be concerned about first starting insulin injections, or fingerstick blood glucose checks, particularly if you have only recently been diagnosed with diabetes. This may lead you to avoid medical appointments and continue to live with high blood glucose levels. If this is the case, you are at risk of becoming unwell with an infection, or with diabetic ketoacidosis (DKA), or hyperosmolar

△ **Boosting your mood**
Regular exercise can help to relieve anxiety and boost your mood if you are depressed. Choose a type of exercise you enjoy so that you stay motivated to do it regularly.

hyperglycemic state (HHS). DKA and HHS (see p.71) can be life-threatening and need urgent medical treatment.

If you have any concerns, share them with your diabetes healthcare professional. Not only will they be able to answer your questions and provide reassurance, they will also give you the opportunity of experiencing a demonstration injection or fingerstick blood glucose check, so that you know the reality. They may also suggest using the new equipment or treatment for a trial period, with an evaluation at the end, to help you gain confidence and alleviate your concerns.

An extreme fear of needles—needle phobia—is rare. If you have it, you may experience severe anxiety symptoms at the sight of needles or blood, such as palpitations, sweating, nausea, and fainting. Having this phobia will make your diabetes difficult to manage, and you may need a referral from your primary care provider for behavioral health counseling.

Anxiety

Occasional bouts of anxiety are common, but if you experience them regularly for six months or more, you may benefit from professional treatment because anxiety can affect all aspects of life, including diabetes. Typical symptoms of anxiety include feeling nervous, being unable to relax, finding it difficult to concentrate, repetitive worrying thoughts, and sleep problems. You may also have panic attacks: sudden episodes of intense fear in a particular situation, such as being in an enclosed space.

Your primary care provider will be able to help, by discussing and assessing your symptoms, prescribing antianxiety medication, and/or referring you for specialized therapy, such as cognitive behavioral therapy (see p.177). They will also be able to advise on how to deal with anxiety on a day-to-day basis, for example, with exercise, relaxation, or breathing activities, and may be able to suggest ways in which you can adjust your diabetes treatment regimen temporarily to make it less stressful.

Depression

Depression is a common problem for people with diabetes, probably at least partly due to the continual need to manage the condition. Being depressed can stop you from looking after yourself and managing your diabetes properly, which is why it is important to recognize the symptoms and obtain professional help.

Typical symptoms of depression include feeling sad, taking less interest or pleasure in activities you usually find enjoyable, tiredness, irritability, difficulty concentrating, problems sleeping, and feeling worthless, guilty, or hopeless. Some of these are similar to those of high blood glucose (see pp.68–69) or low blood glucose (see pp.62–67). However, with depression, the symptoms persist long-term, whereas with the other conditions symptoms improve once the underlying blood-glucose problem has been corrected.

If you suspect you have depression, you can consult with your healthcare professional for assessment, and for treatment and/or referral to a specialist, such as a psychologist. Treatment may involve a talking therapy, such as cognitive behavioral therapy (CBT, see p.177), medication, or both. Your health professional will also be able to help you with managing your diabetes while you are depressed.

Eating problems

When you have diabetes, you need to pay extra attention to food, but if you regularly have concerns about food and eating, such as restricting your food to manage your weight, this is known as disordered eating. Certain specific eating behaviors are also considered to be eating disorders (see panel, above right). One example is using less insulin than is needed in order to lose weight. Known as insulin restriction, this may lead to diabetic ketoacidosis or hyperosmolar hyperglycemic state.

Eating problems make diabetes harder to manage and may make physical complications more likely to develop. Your health professional will ask about your eating during your health reviews. They will also share any concerns they have about your weight or eating and, if necessary, will arrange for help from a specialist, for example, a dietitian and/or therapist. They will continue to help you manage your diabetes during any specialist treatment.

FEATURES OF EATING DISORDERS

The main eating disorders are anorexia nervosa (commonly known as anorexia), bulimia nervosa (or bulimia), and binge-eating disorder. They are all characterized by particular attitudes to food, but have different behavioral features.

DISORDER	COMMON FEATURES
Anorexia	Preoccupation with body weight and size; severe restriction of calorie intake; extreme weight loss; excessive exercising; use of laxatives and/or appetite suppressants.
Bulimia	Binge eating followed by self-induced vomiting and/or laxative use; episodes tend to occur regularly, such as weekly; guilt after binge eating; physical weakness.
Binge-eating disorder	Eating very large amounts in a short time; eating secretly and/or trying to hide how much food is eaten; feeling a loss of control when eating large amounts; often, weight gain.

Mental health concerns could potentially affect your ability to manage your diabetes

GET EMERGENCY MEDICAL HELP

- If you have thoughts of self-harm or suicide.
- If you have symptoms of diabetic ketoacidosis or hyperosmolar hyperglycemic state (see p.71).

Eye conditions

Long-standing diabetes or raised blood glucose can cause damage to your eyes' blood supply. This condition is called retinopathy and, if untreated and progressive, may lead to loss of vision. Regular eye checks are vital to enable early detection and treatment, and careful diabetes management can prevent the condition from worsening and affecting vision. Cataracts are also more common if you have diabetes but can be treated to prevent visual impairment.

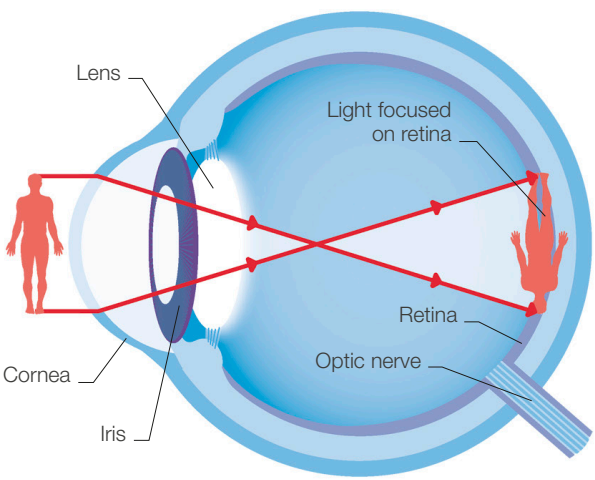
Retinopathy

The retina is the light-sensitive layer of the eye. To function properly, it needs a plentiful supply of blood, provided by a network of tiny vessels. In long-term diabetes, constant high blood glucose and/or high blood pressure may lead to retinopathy, in which these vessels become weak and fragile.

Stages of retinopathy

There are three main stages of retinopathy:

- **Background retinopathy** In this early stage, blood vessels bulge and leak blood. These bulges, known as microaneurysms, appear as small red dots during examination of the retina. Yellowish spots called exudates (formed of substances leaked from the blood vessels), and white areas known as cotton-wool spots (where blood vessels have closed down) may also develop. Many people who have had type 1 diabetes for about 20 years have some background retinopathy but it does not always progress further.
- **Preproliferative retinopathy** In this stage (also sometimes known as nonproliferative retinopathy), the damage is progressing. Eye examinations reveal many microaneurysms, exudates, and cotton-wool spots. New, fragile blood vessels start to form on the retina to replace the ones that have closed down.
- **Proliferative retinopathy** If preproliferative retinopathy is not treated, many more fragile new blood vessels form on the retina. These vessels may bleed into the eye, causing reduced vision.



△ **Function of the eye**
Light entering the eye is focused by the cornea and lens onto the retina. Cells here convert the light to nerve impulses; these pass along the optic nerve to the brain, where they are interpreted as an image.

Causes

Retinopathy can result from long-standing diabetes or a blood glucose level that has been consistently raised for years. High blood pressure can also be a contributing factor. Pregnancy may cause retinopathy to appear or to progress more rapidly than it would otherwise.

Symptoms and diagnosis

Retinopathy does not usually cause symptoms until the proliferative stage, when it starts to impair vision. It may affect one or both of your eyes and there may be partial or total loss of vision.

△ **Retinal photography**
Digital photographs of your retina may be taken to check for retinopathy. In the images, the blood vessels can be seen as a network branching from the optic disk, where the optic nerve starts.

It is important to have an eye exam to check for retinopathy at least once a year. This involves taking photographs of your retina to check for signs of damage. If you already have retinal damage or you are pregnant, you will be offered eye tests more often. These may include tests of visual acuity, in which you are asked to read letters of diminishing size, or a dilated eye exam; and a direct visual examination of your retina using an instrument called an ophthalmoscope. If you already have advanced retinopathy, you may also have specialized imaging to pinpoint the affected area of your retina.

Complications of retinopathy

If retinopathy is treated early, its progress can often be prevented. However, without treatment, retinopathy can progress and lead to complications such as macular degeneration, vitreous hemorrhage, retinal detachment, or glaucoma (see p.183).

Maculopathy affects the macula, the small central area of the retina that is responsible for high-resolution color vision. It is more common if you have type 2 diabetes. In maculopathy, the tiny blood vessels around the macula may leak, leading to a buildup of fluid; the blood supply to the macula may be reduced; or fatty deposits may accumulate on the macula. In all of these, the macula becomes damaged, which may threaten your eyesight.

Vitreous hemorrhage is bleeding into the vitreous humour, the jellylike substance that fills the back of the eye. It occurs if you have proliferative retinopathy and the new blood vessels in your retina bleed profusely. You may suddenly lose a large part of your vision, although this is usually temporary as the blood is gradually reabsorbed.

Retinal detachment, in which your retina becomes separated from the underlying layers of the eye, may occur a few weeks after a vitreous hemorrhage. Without treatment, it can cause permanent damage to your vision.

Prevention and treatment

The best way to prevent retinopathy from developing or progressing is careful long-term blood glucose management, and, if you have high blood pressure, treating this effectively (see pp.192–197). It is also important for you to attend your appointments for eye examinations, inlcuding retinal screening.

Treatment of retinopathy depends on how advanced the condition is. If you have background retinopathy, you don't need any treatment, but your eyes need to be examined every six months. If you have a high blood glucose level that suddenly reduces because you are intensifying your treatment, your retinopathy may actually worsen; lowering your blood glucose level over a few months rather than weeks can prevent this.

If you have preproliferative or proliferative retinopathy, you will probably be offered laser treatment to target the fragile new blood vessels in the damaged area of your retina. Maculopathy may be treated with lasers, or sometimes with injections of medication into the eye. You may also have laser treatment following a vitreous hemorrhage or to treat retinal detachment, although sometimes conventional surgery may be recommended.

Treatment can usually prevent deterioration in your vision but cannot restore visual loss due to retinal damage that has already occurred. If your condition stabilizes after treatment, the time between your eye examinations may gradually increase, for example, to once every 6 or 12 months.

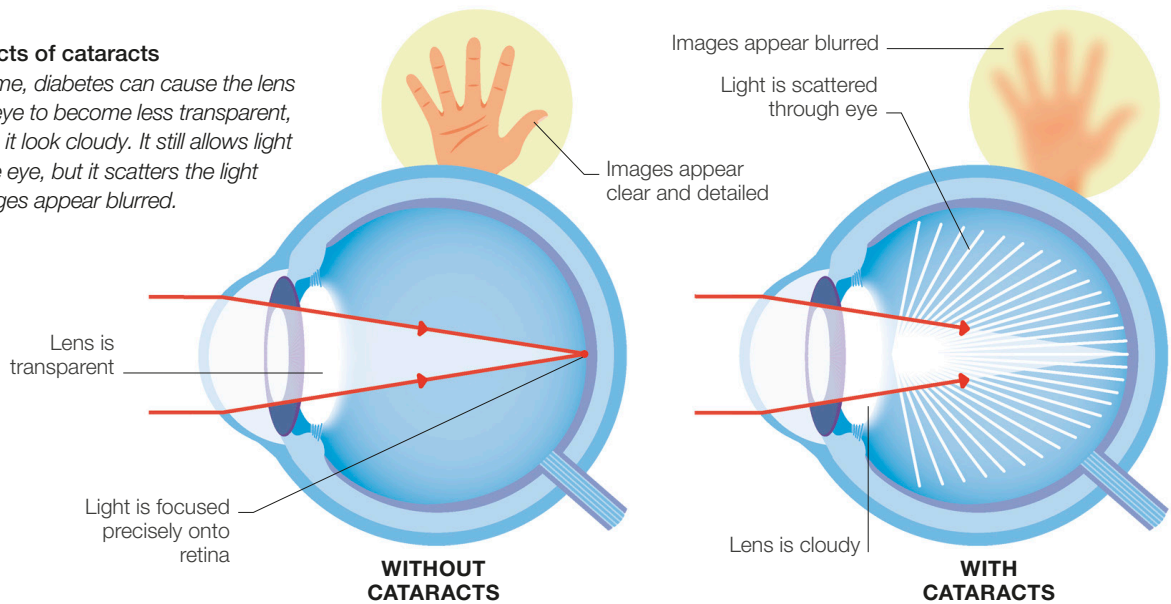
Cataracts

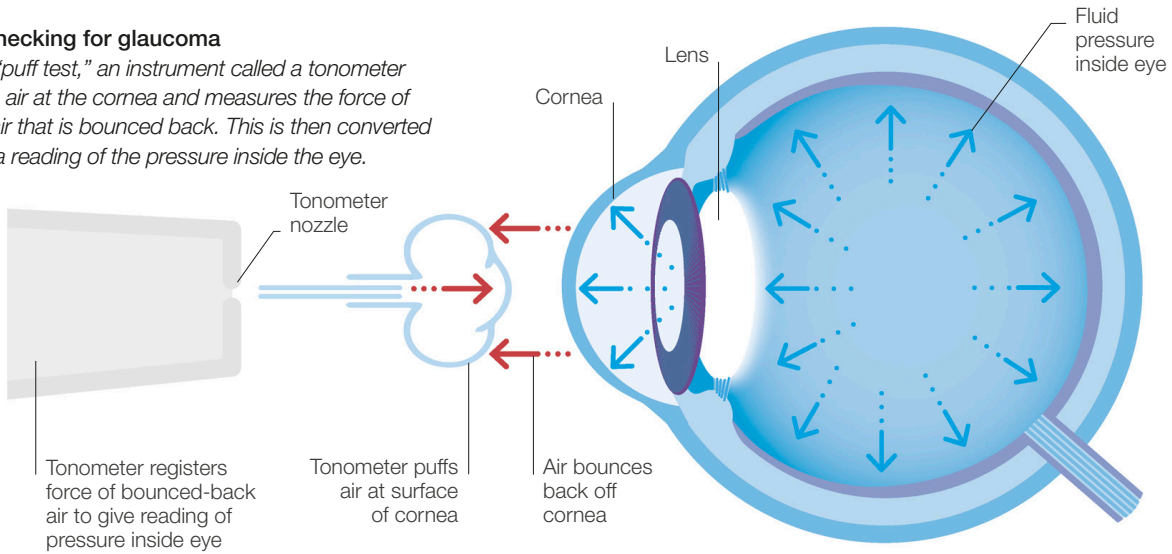
If you have diabetes, you are more prone to cataracts, in which the lens of the eye, which is normally clear, becomes cloudy. Cataracts develop as a result of changes to protein fibers in the lens. These changes are a normal part of aging (which is why people who don't have diabetes can also develop them), but they can also be due to a blood glucose level that has been high for many years.

Symptoms and diagnosis

The cloudiness of the lens reduces the amount of light entering the eye. As a result, vision becomes blurred and distorted; in addition, bright lights may appear to have a halo. Because cataracts are progressive, they cause a gradual deterioration in vision (although not complete sight loss, as light can still enter the eye and reach the light-sensitive

▷ **Effects of cataracts**
Over time, diabetes can cause the lens of the eye to become less transparent, making it look cloudy. It still allows light into the eye, but it scatters the light so images appear blurred.





▷ **Checking for glaucoma**
In a "puff test," an instrument called a tonometer puffs air at the cornea and measures the force of the air that is bounced back. This is then converted into a reading of the pressure inside the eye.

retina even when cataracts are advanced). Cataracts are diagnosed by direct inspection of the front of the eye during an eye examination.

Prevention and treatment

You can reduce your risk of developing cataracts by getting to, or close to, your blood glucose target range. Cataracts develop slowly and may never reach a stage at which they need treatment. If they seriously impair vision, they can be surgically removed and a new artificial lens inserted. This surgery usually restores vision, although you will probably need glasses or contact lenses afterward.

Diabetes-related glaucoma

Glaucoma is a condition in which the pressure of the fluid inside your eye becomes too high. The pressure can damage the retina and, if untreated, can lead to loss of vision. Glaucoma can affect anybody, but people with diabetic retinopathy are at increased risk of developing it. Glaucoma may not produce noticeable symptoms in its early stages, but later it may cause pain and increasing visual impairment.

Glaucoma can be detected during a routine eye examination by a simple "puff test" to measure the pressure inside the eye. It can usually be treated successfully, either with medication or with surgery. Treatment should prevent any further deterioration in vision, although any vision loss that has already occurred will be permanent.

Living with reduced vision

If your vision is adversely affected by retinopathy or cataracts, making adjustments in your life may help you to cope. There are various benefits and other forms of support to help you do this. To find out more, contact a national organization for people with reduced vision or diabetes, or both.

Impaired vision could affect your ability to manage daily tasks, and specifically those that are related to your diabetes. If you find that checking your blood glucose level, taking pills, and/or injecting yourself is difficult, ask your health professional about aids that can make things easier, for example "talking" glucose meters, large displays, and click pen devices. Hypoglycemia (see pp.62–67) can be problematic because you may not be able to see well enough to treat yourself. You can ask someone close to you for help with these tasks, or ask your health professional for their ideas and support. If you drive, you may need to establish whether it is safe for you to continue driving.

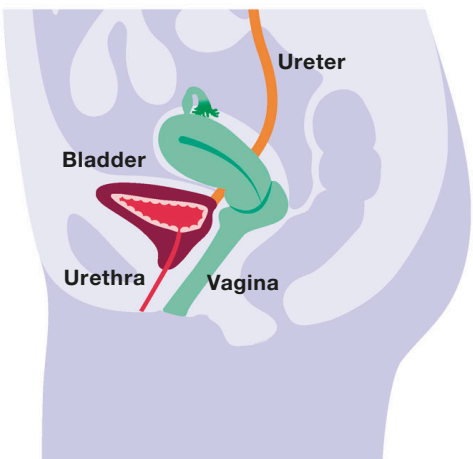
Urinary system conditions

People with diabetes are at an increased risk of developing problems with the urinary system—the kidneys, ureters (tubes from the kidneys to the bladder), bladder, and urethra (tube from the bladder to outside the body). Common problems include cystitis (infection of the bladder) and genital candidiasis (yeast infections). Kidney disease (nephropathy) is also a risk, particularly for people who have had diabetes for years.

Cystitis

Inflammation of the bladder, known as cystitis, is typically due to a bacterial infection. It is more common in people with diabetes because a slightly raised blood glucose level and/or glucose in the urine provides a good environment for bacteria to thrive.

Cystitis is thought to occur when bacteria that normally live harmlessly on the skin or in the bowel get into the bladder through the urethra. Cystitis is more common in women than men, because their urethras are shorter than men's, making it easier for bacteria to pass into the bladder. Cystitis is not classed as a sexually transmitted infection, but having sex is one way in which bacteria can get into the urinary tract. The main symptoms of cystitis include pain when urinating; a frequent and urgent need to urinate; and pain in the lower abdomen. If you have cystitis, you may be able to treat it yourself by taking acetaminophen or ibuprofen and



△ **Urinary system infections in women**
In women, cystitis and genital candidiasis are fairly common, even in women who do not have diabetes. Cystitis affects the bladder, whereas genital candidiasis affects the external genitals (vulva) and/or vagina.

CYSTITIS SYMPTOMS
Pain, burning, and/or stinging when urinating.
Needing to urinate urgently and frequently.
Pain in the lower abdomen.
Dark, cloudy, or strong-smelling urine.

CANDIDIASIS SYMPTOMS
Itching and irritation around the vagina.
Pain, soreness, stinging when urinating or during sex.
Thick, white, usually odourless discharge from the vagina.

drinking plenty of water. You should avoid sex until you feel better, as it may make the condition worse. If symptoms last a few days, consult a health professional, as you may need additional medical treatment. You should also seek advice if you are not certain your symptoms are due to cystitis.

Genital candidiasis

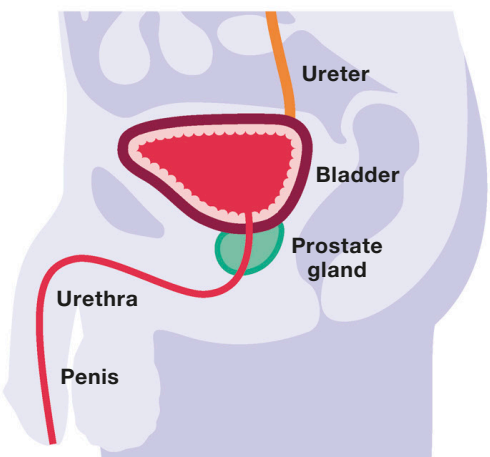
Commonly known as a yeast infection, genital candidiasis is caused by a fungus. Like cystitis, it is more common in women than in men. It is thought to be due to an overgrowth of fungi that normally live harmlessly in the body. People with diabetes are more susceptible to the condition because glucose in their urine can cause the fungi to multiply.

Candidiasis does not always cause symptoms. If they do occur, in women the main ones are itchiness and pain around the entrance of the vagina; a white discharge that may resemble cottage cheese but does not usually smell; and pain or stinging during urination or sex. In men, there may be irritation, pain, and redness around the head of the penis and under the foreskin; a white discharge, which may resemble cottage cheese and usually smells unpleasant; and difficulty retracting the foreskin. Candidiasis is treated with an antifungal medication, available as a prescription or over-the-counter.

AVOIDING URINARY TRACT INFECTIONS

You can reduce your risk of cystitis and candidiasis by:

- Keeping your blood glucose often in your target range.
- Drinking plenty of water.
- Emptying your bladder frequently and completely.
- Wearing loose cotton underwear.
- Keeping your genitals clean, and drying fully after washing.
- For women, wiping from front to back after a bowel movement.
- Avoiding the use of perfumed toiletries, deodorants, or douches on your genitals.



△ **Urinary system infections in men**
In men, a fungal infection may affect the head of the penis and under the foreskin, causing genital candidiasis, or bacteria may enter the urethra and move up to the prostate gland or bladder, causing cystitis.

CYSTITIS SYMPTOMS
Pain, burning, and/or stinging when urinating.
Needing to urinate urgently and frequently.
Pain in the lower abdomen.
Dark, cloudy, or strong-smelling urine.

CANDIDIASIS SYMPTOMS
Irritation, burning, and redness around the head of penis and under the foreskin
Thick, white, unpleasant-smelling discharge from the penis
Difficulty retracting the foreskin

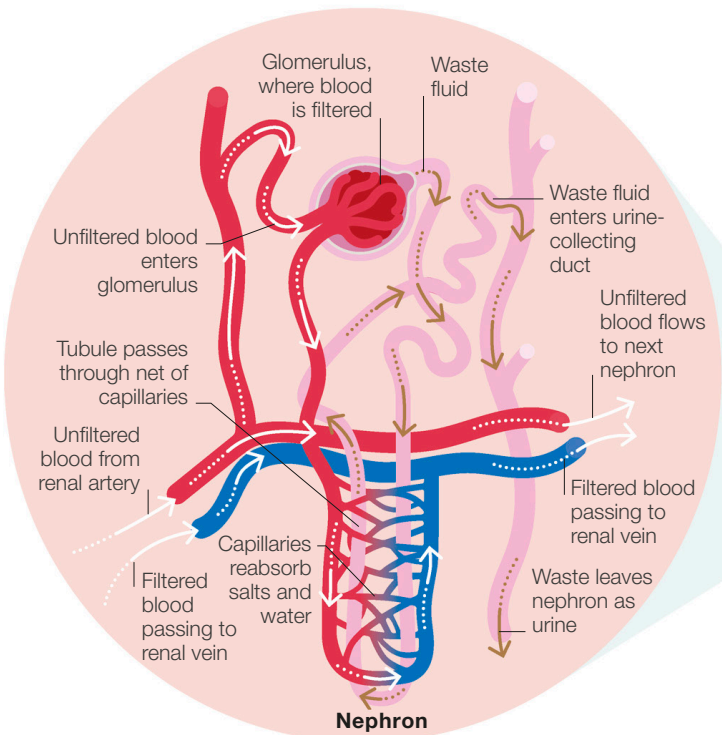
Nephropathy

The kidneys filter the blood and remove waste products by making urine. They also regulate the amount of fluid and salts in the body, which helps to regulate blood pressure. The kidneys' main filtering units are called nephrons. Nephropathy progressively impairs the kidneys' ability to function properly, which causes illness and may lead to kidney failure. The condition develops slowly over a period of years. Consistently raised blood glucose and blood pressure can damage the nephrons. Their blood vessels become blocked, allowing protein to leak into the urine and waste products to remain in the blood.

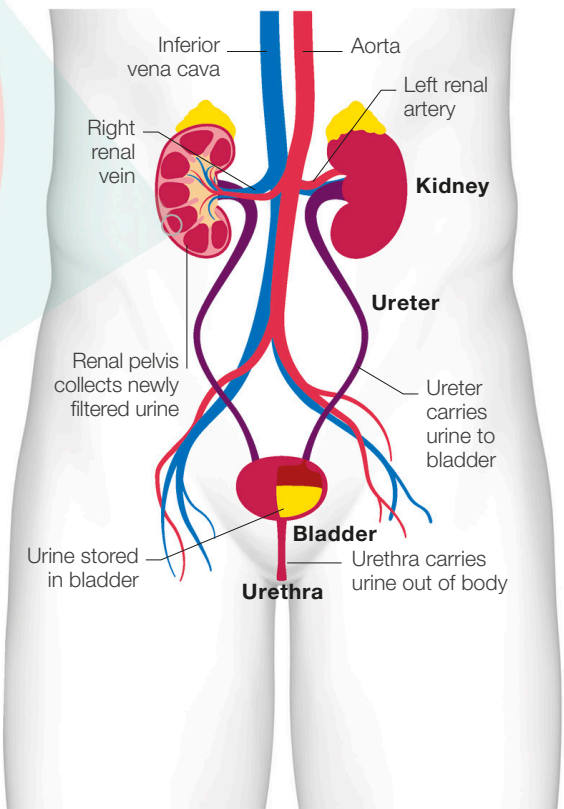
Stages of nephropathy

In the earliest stage of nephropathy, minute amounts of a protein called albumin are found in the urine—a condition called microalbuminuria. This does not produce any symptoms, so your health professional will carry out urine tests once or twice a year to check for early signs of kidney damage.

If nephropathy worsens, larger amounts of protein will be found in the urine—a condition known as proteinuria. You may develop proteinuria temporarily if you have a kidney or bladder infection; the protein usually disappears when the infection clears up. However, if proteinuria persists, it means the kidneys have been



△ **The kidneys**
Each kidney contains about a million filtering units called nephrons. Each nephron has a glomerulus, which filters out wastes and excess fluid, and a long tubule that reabsorbs essential substances into the blood. The waste leaves the kidney as urine.



permanently damaged and they are no longer able to filter out wastes or remove excess fluid efficiently. Proteinuria may not always produce symptoms but can cause problems such as swollen ankles or legs due to fluid retention; shortness of breath; tiredness; nausea; and itchy skin. For a definite diagnosis, your health professional will carry out urine and blood tests. You may also need an ultrasound scan.

If left untreated, proteinuria may lead to end-stage kidney failure, in which there is permanent loss of all, or almost all, kidney function. The main symptoms of this condition include swelling of the face, limbs, and abdomen; a greatly reduced output of urine; severe lethargy; weight loss; headache; vomiting; and very itchy skin. Diagnosis usually involves urine tests, blood tests, and sometimes also imaging procedures, such as an ultrasound scan or a CT scan.

Prevention and treatment

Keeping your blood glucose and blood pressure in your target ranges will help to prevent nephropathy from developing or progressing. If microalbuminuria is diagnosed and your blood glucose is high, you will be supported to reduce it. If you have high blood pressure, you may be prescribed medication to lower it. Stopping smoking, losing weight if you need to, reducing sodium intake, and eating less fat if you have high cholesterol also help to lower blood pressure. You may be prescribed ACE (angiotensin-converting enzyme) inhibitor medication to help slow down the progression of nephropathy. Your health professional will also regularly monitor your blood pressure, kidney function, and blood glucose and A1c tests (see p.31).

If you develop proteinuria, you may be advised to eat less protein and less of foods that are high in phosphorus (such as milk, regular or diet cola, and chocolate) or salt, to prevent wastes from building up in your body. A registered dietitian can give you individually tailored advice. Your diabetes medication may also be changed.

If you develop end-stage kidney failure, the main treatment options are dialysis or a kidney transplant. You will also need to adjust the dose of your diabetes medication. A registered dietician who specializes in end-stage kidney disease can give you personalized meal-planning advice.

LOOKING AFTER YOUR KIDNEYS

Taking care of your kidneys is a vital part of your diabetes care; these steps can help to prevent kidney disease from developing or worsening.

- Keep your blood pressure and blood glucose within your recommended target ranges.
- Have your urine tested for protein and blood tests for kidney function at least once a year, or more often if recommended by your health professional.
- If you smoke, stop.
- Lose weight, if necessary.
- Try to follow healthy eating and physical activity guidelines.
- Attend all of your medical appointments, especially your annual physical.

Keeping your blood glucose and blood pressure well managed is vital to help prevent nephropathy from developing or progressing

Foot conditions

When you have diabetes, you are at risk of foot problems occurring due to nerve damage in your legs (peripheral neuropathy) or poor blood circulation to your feet (peripheral ischemia). Either or both of these conditions makes you more susceptible to associated complications, such as ulcers and even severe infections, such as gangrene. However, good foot care can help prevent such problems.

Peripheral neuropathy

In peripheral neuropathy, nerves supplying your extremities (the ends of your limbs) are damaged due to repeated periods of high blood glucose, as well as high blood pressure (see pp.192–193) in the tiny vessels supplying the nerves. The damage occurs over months or years. It most commonly affects the feet, as they are supplied by the longest nerves and they bear your body weight. It may also affect the lower legs or, rarely, the arms and hands.

Symptoms and diagnosis

The main symptoms are pain and alterations in sensation (such as tingling or burning); some people don't have any symptoms, whereas in others they may be severe. The condition may come on gradually, and you may not even notice it, so your feet need to be examined by a health professional at least once a year. They will check for reddened areas caused by pressure; dry skin; calluses; wounds or open sores; abnormal warmth; and any changes in

CHARACTERISTICS OF FOOT CONDITIONS

Peripheral neuropathy and ischemia have different characteristics. It is possible to have a combination of the conditions, known as neuroischemia, which further increases your chances of developing foot problems.

PERIPHERAL NEUROPATHY	PERIPHERAL ISCHEMIA
Warm skin	Cool or cold skin
Lack of feeling in foot or feet	Normal or slightly reduced feeling
May be painless, but pain can occur and is most severe at night	Painful during exertion or at rest at any time of day
Normal or increased pulses in the feet	Faint pulses in the feet, or no pulses at all
Callused skin	No calluses
Reduced reflexes	Normal reflexes
Prone to ulcers on any areas of pressure: for example, the soles of the feet	Prone to ulcers on the sides of the feet
Potential to develop Charcot (misshapen) foot	Potential to develop gangrene

the shape of your feet. To assess sensation, they will touch different areas of your feet while you have your eyes closed or are looking away and ask whether you can feel the touches. They will also check the reflexes in your ankles and knees, to detect any muscle weakness due to nerve damage.

Prevention, treatment, and outlook

You can reduce the likelihood of developing peripheral neuropathy by careful blood glucose management and meticulous foot care (see pp.122–123). If you do develop the condition, you will be at greater risk of damaging your feet, so ask your health professional for advice about specific risks, how to prevent them, and what to do if problems arise. You also need to check your feet daily yourself.

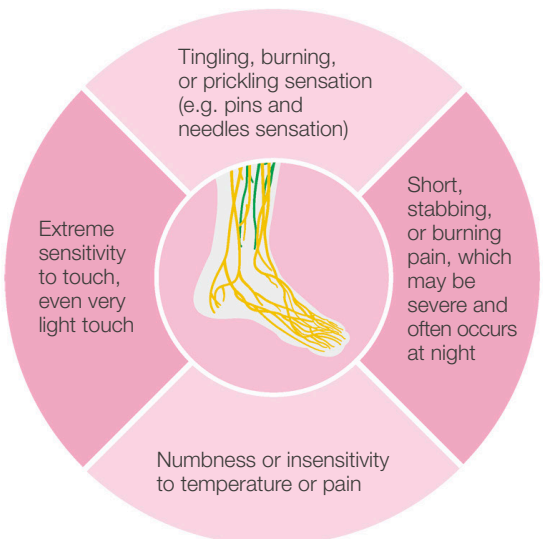
If the peripheral neuropathy is painful, you may be prescribed medication for pain relief. If bedding irritates your feet and legs, applying a film dressing may help. You can also ask your health professional about having a bed cradle to keep bedding off your feet and legs. Nerve damage that has already occurred is irreversible; however, you can stop it from getting worse by careful blood glucose management and good personal foot care.

Peripheral ischemia

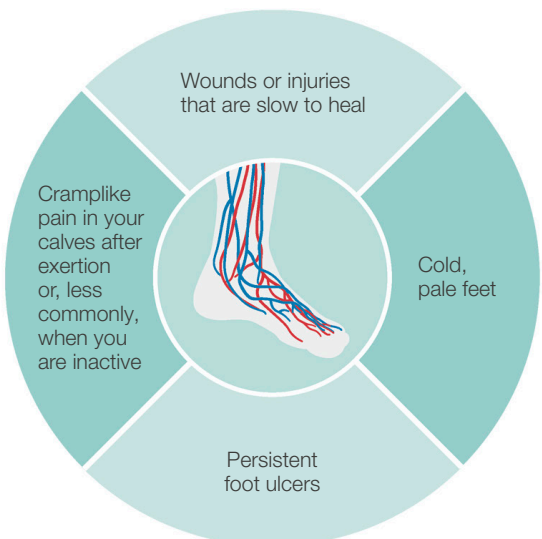
In this condition, the blood supply to your legs and feet is reduced due to narrowing of the arteries, which deprives your legs and feet of oxygen and nutrients. This narrowing may be caused by atherosclerosis (buildup of fatty areas inside arteries). Factors that increase the risk of developing peripheral ischemia include smoking, high blood cholesterol, a high-fat diet, and persistently raised blood glucose levels.

Symptoms and diagnosis

Symptoms include cramps, cold skin, and wounds that don't heal properly. As the symptoms usually develop over months or years and you may not even notice any changes, you must have your feet

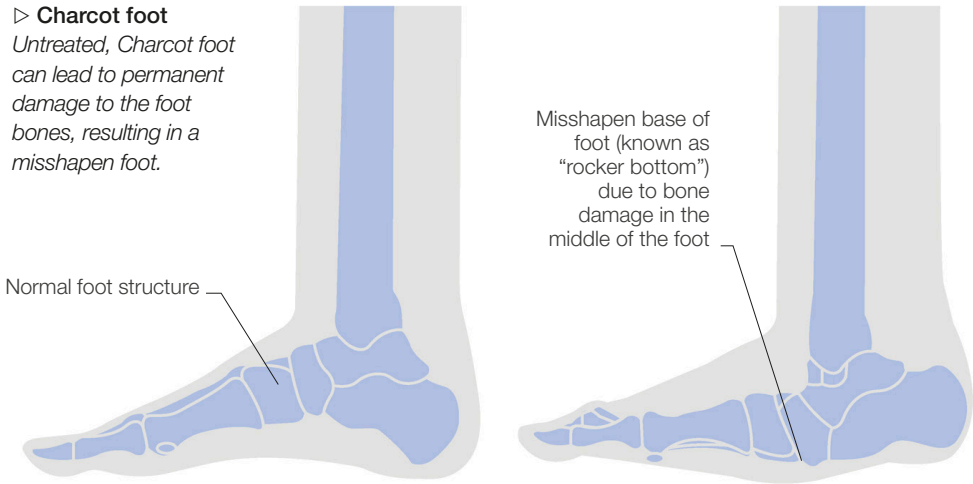


△ **Common symptoms of peripheral neuropathy**
Peripheral neuropathy may not produce noticeable symptoms, or the symptoms may change over time. Any symptoms may affect the toes, a small part of one foot, parts of both feet, or all of both feet.



△ **Common symptoms of peripheral ischemia**
Symptoms of peripheral ischemia tend to develop slowly. Typically, both legs and/or feet are affected at the same time, although in some people the symptoms may be worse in one leg or foot.

▷ **Charcot foot**
Untreated, Charcot foot can lead to permanent damage to the foot bones, resulting in a misshapen foot.



examined by a health professional at least once a year. As well as testing your nerve responses (see p.189), they will check the pulses in your feet; a faint or absent pulse may indicate ischemia.

Prevention, treatment, and outlook
You can help to prevent peripheral ischemia by eating healthily; not smoking; being active; taking your medication as recommended; and careful blood glucose management.

If you are diagnosed with peripheral ischemia, you will be referred for scans and other tests to assess the blood flow in your legs. Peripheral ischemia is irreversible, but it can often be stabilized or treated to improve blood flow. If the ischemia is mild, your health professional may advise lifestyle changes and/or medication to prevent the condition from getting worse. If it is more severe, you may be advised to have surgery to widen or bypass affected blood vessels.

Untreated, peripheral neuropathy and/or ischemia can lead to potentially serious complications

Possible complications

Untreated, peripheral neuropathy or ischemia can lead to potentially serious complications, including Charcot foot, ulcers, and possibly loss of the blood supply, which may result in gangrene.

Charcot foot
A complication of peripheral neuropathy, Charcot foot can result in permanent foot deformity. In the condition, the bones of the feet become weaker and easily damaged, so that even a minor injury can cause them to disintegrate or fracture. New bone forms at the site of the damage but the foot becomes misshapen as a result. An early sign is a hot, swollen, painful foot that gets worse over 2–3 months. To treat it, your health professional may advise you to keep weight off the foot; they may also fit you with a cast in the short term and specially made footwear in the long term.

ASSESSING YOUR RISK OF FOOT ULCERS

You are likely to develop foot ulcers if:

- Your blood glucose level has been above 200 mg/dl for long periods of time.
- Your blood pressure is over 140/90 and is not properly treated with medication.
- You have pins and needles or a burning sensation in your feet, or the skin there is acutely sensitive.
- You smoke.
- You have had foot ulcers before.
- You have poor circulation in your legs.
- You have reduced sensation in parts of your feet.

Foot ulcers

Ulcers may result from either neuropathy or ischemia. They are most likely to occur on the soles of the feet or on areas subjected to pressure (for example, from tight shoes). Ulcers need immediate attention to prevent serious damage or infection. Check your feet every day for wounds, bruises, or calluses that don't start to heal after a few days, or for red, hot areas. If you find any, alert your health professional as soon as you can. They will clean and dress any ulcers, give you antibiotics to treat infection, and fit you with a cast or footwear to protect the area from pressure as it heals.

Gangrene

This is a complication of peripheral ischemia in which tissues lose their blood supply completely. The skin turns bluish-purple and then black. To prevent it, any wounds or sores must be treated as soon as possible. If a toe or foot develops gangrene, amputation may be needed to stop the damage from spreading.

◁ **Treating a foot ulcer**
If you have a foot ulcer, your health professional will clean out the infected tissue then dress the wound to prevent further infection.

Cardiovascular conditions

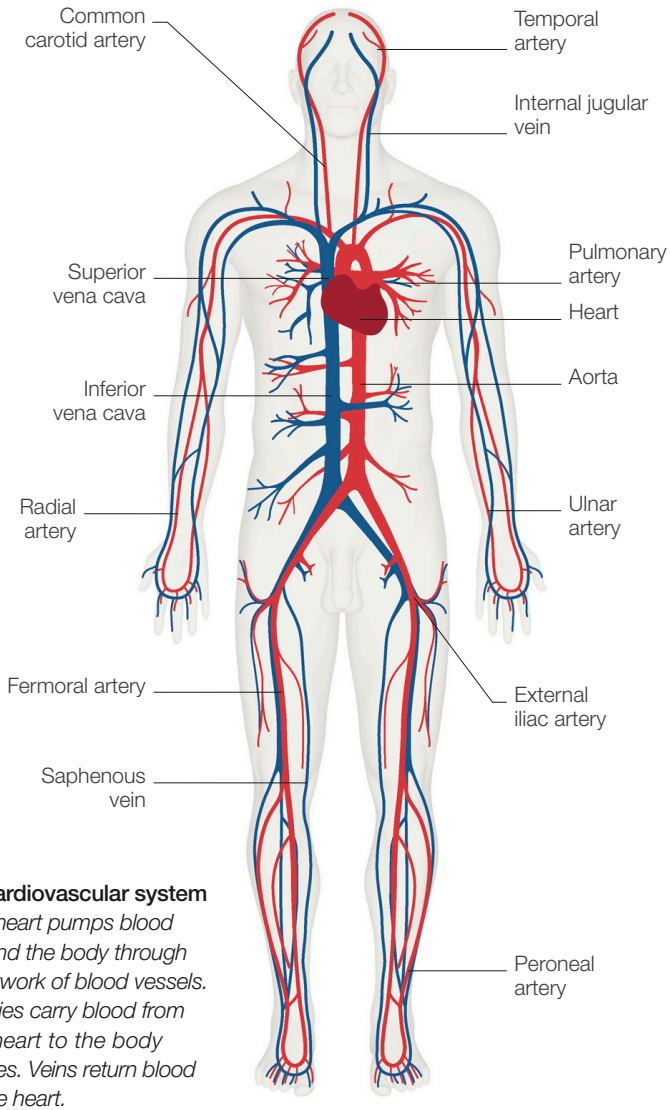
Diabetes is strongly linked to high blood pressure and hyperlipidemia (high blood lipid levels) which, as well as being cardiovascular (heart and circulatory) conditions themselves, are also major risk factors for other cardiovascular problems. Identifying your risk factors and making relevant changes to your lifestyle will help to prevent heart and circulation problems from developing.

High blood pressure

Known medically as hypertension, high blood pressure is a contributor to other complications of diabetes, such as eye problems (see pp.180–183), kidney conditions (see pp.184–187), coronary heart disease (see pp.194–195), stroke (see p.196), and peripheral vascular disease (see p.197). The link between high blood pressure and diabetes is not yet fully understood, but it may be partly related to the level of insulin in the blood. In type 1 diabetes, high blood pressure also often occurs if your kidney function starts to deteriorate; in type 2 diabetes, it is linked with hyperlipidemia and being overweight.

Being less active, smoking, high alcohol consumption, and stress are also risk factors. Addressing any or all of these can help to prevent high blood pressure (see panel, p.197).

High blood pressure rarely produces symptoms. If you have diabetes and a blood pressure of 140/90 millimeters of mercury (mmHg) or above when you are tested on several occasions, you will be diagnosed with high blood pressure. The first figure refers to the pressure when your heart contracts, the second figure refers to when your heart relaxes between beats.



▷ **Cardiovascular system**
The heart pumps blood around the body through a network of blood vessels. Arteries carry blood from the heart to the body tissues. Veins return blood to the heart.

BLOOD LIPID LEVELS

Lipid levels are measured by analyzing a blood sample for HDL (high-density lipoprotein) cholesterol, LDL (low-density lipoprotein) cholesterol, and often also for triglycerides. HDL cholesterol is often called "good" cholesterol, because it helps to lower blood levels of LDL ("bad") cholesterol. Triglycerides are carried in the blood and used for energy or stored as body fat. In general, the goal is to have a low total lipid level, a low level of LDL cholesterol, a low level of triglycerides, and a relatively high level of HDL cholesterol.

	LDL ("BAD") CHOLESTEROL LEVEL (MG/DL)	HDL ("GOOD') CHOLESTEROL LEVEL (MG/DL)	TRIGLYCERIDE LEVEL (MG/DL)
Unhealthy	Above 100 mg/dl	Below 50 mg/dl	Above 150 mg/dl
Healthy	Below 100 mg/dl	Above 50 mg/dl	Below 150 mg/dl

KEY

LDL cholesterol HDL cholesterol Triglyceride

If you are diagnosed with high blood pressure, you will be prescribed medication to lower it, and your blood pressure will be reviewed every three to six months. It may be necessary to take more than one type of medication, but treatment is usually very effective.

Hyperlipidemia

A high level of lipids (fats and fatlike substances, such as cholesterol) in the blood, referred to as hyperlipidemia, is a major cause of coronary heart disease, stroke, and peripheral artery disease. It is more common in people with type 2 diabetes. The link between diabetes and hyperlipidemia is not fully understood, but in type 2 diabetes, the high level of insulin caused by insulin resistance is thought to be partly responsible. If you have type 2 diabetes, you are more likely to develop hyperlipidemia if you are overweight and have high blood pressure. Other general risk factors in either type 1 or type 2 diabetes include eating foods high in saturated fats, inactivity, smoking, an underactive thyroid gland, and a raised blood glucose level over years. A high alcohol intake and/or family history of hyperlipidemia are also risk factors. In general, your likelihood of developing hyperlipidemia can be reduced by self-care measures (see panel, p.197).

Hyperlipidemia rarely produces symptoms. At your annual physical (see pp.142–143) you will have a blood test ordered to measure your lipid levels. If your levels are outside the healthy range, you will be offered advice and possibly also medication to reduce your lipid levels, such as statins. Subsequently, your blood lipid levels may be checked every three to six months to assess how well the treatment is working.

Having diabetes means you are at an increased risk of developing coronary heart disease

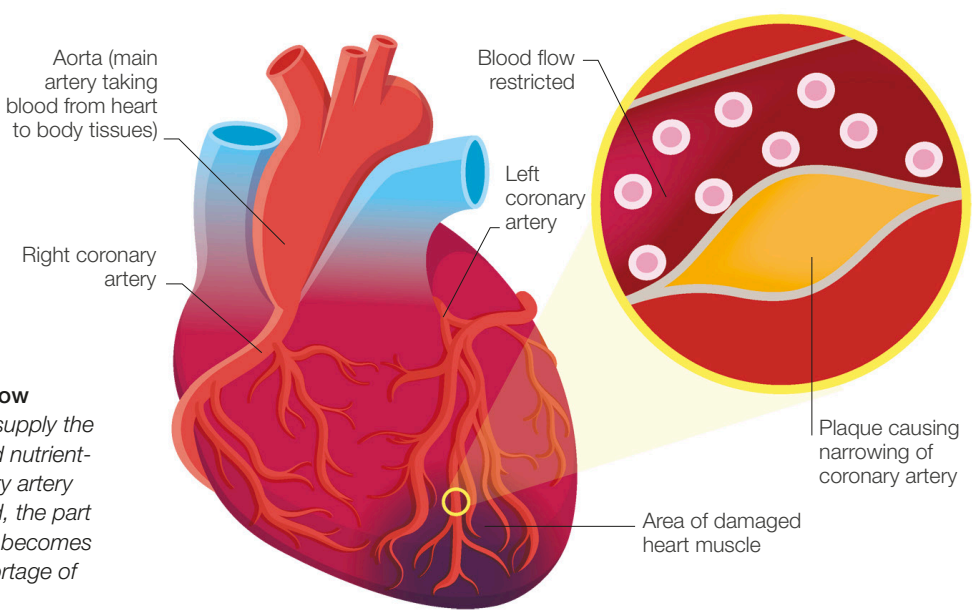
Coronary heart disease

In coronary heart disease (CHD), fatty deposits known as atheromas (also sometimes called plaques) build up in the coronary arteries—the two main arteries that supply the heart itself with blood—and restrict blood flow to the heart muscle.

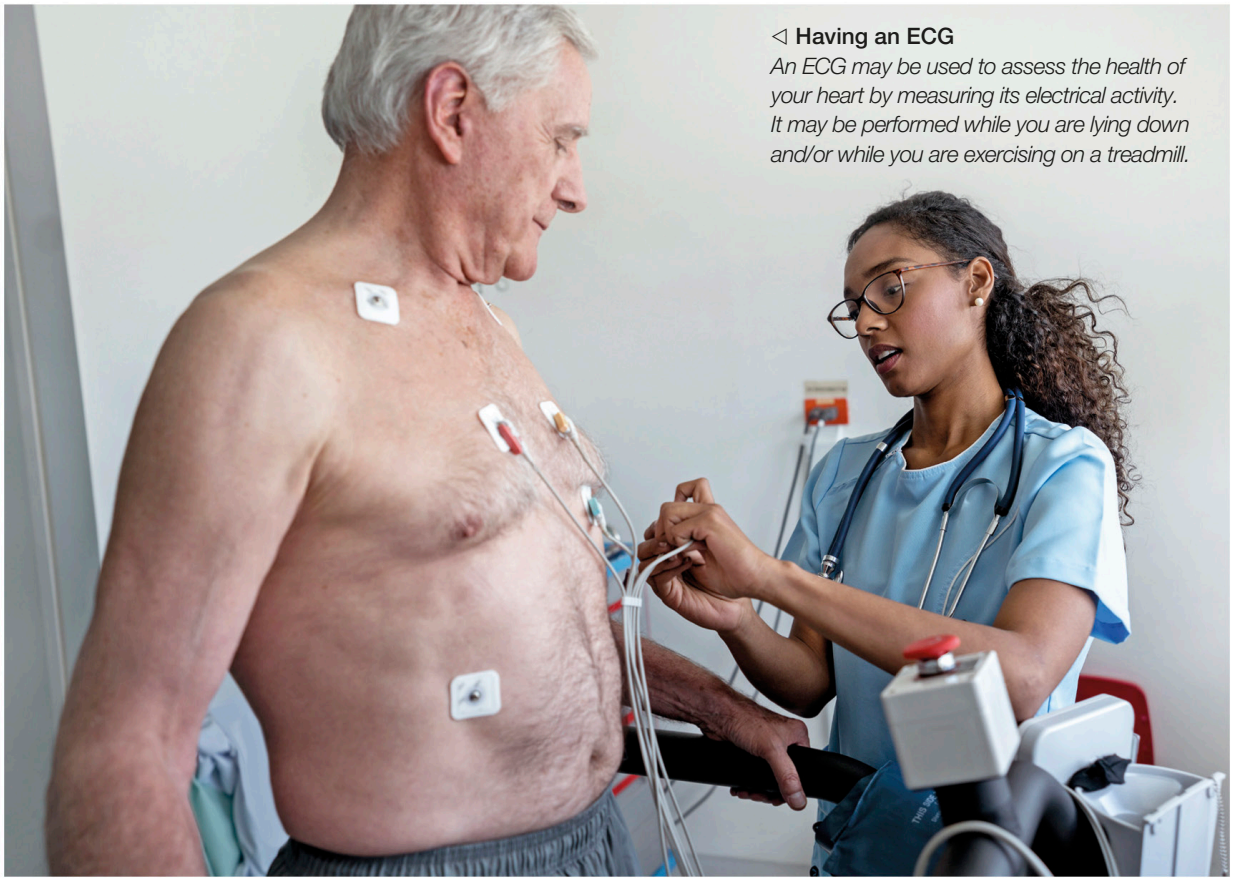
Having diabetes means that you are at increased risk of developing CHD. Other risk factors include high blood pressure, hyperlipidemia, a high intake of saturated fat, lack of physical activity, smoking, being overweight, a family history of CHD, and a blood glucose level that has been persistently raised for a period of years. Taking steps to reduce any of these risk factors will help you to avoid CHD (see panel, p197).

When blood flow through the coronary arteries is restricted, you may experience angina, a heart attack, or heart failure.

- **Angina** This produces a temporary sensation of pain or pressure in your chest. You may also experience pain in your left shoulder or down the inside of your left arm, especially when you are stressed or exert yourself.
- **Heart attack** This typically causes severe pain in the center of your chest that may spread to the jaw, neck, arms, or back; breathlessness, palpitations, sweating, lightheadedness, nausea, and sometimes loss of consciousness. However, some people have very mild or no symptoms. A severe heart attack may be rapidly life-threatening.
- **Heart failure** In this condition, the heart becomes less effective at pumping blood around the body. Signs of heart failure include swelling in your legs, feet, and abdomen, shortness of breath, tiredness, and lack of energy. In many people, the condition worsens slowly over time.



▷ **Restricted blood flow**
The coronary arteries supply the heart with oxygen- and nutrient-rich blood. If a coronary artery is narrowed or blocked, the part of the heart it supplies becomes damaged due to a shortage of oxygen and nutrients.



◁ **Having an ECG**
An ECG may be used to assess the health of your heart by measuring its electrical activity. It may be performed while you are lying down and/or while you are exercising on a treadmill.

CHD may be diagnosed by means of an electrocardiogram (ECG) in which the heart's electrical impulses are recorded. Various imaging techniques may also be used to view the heart and assess the health of the coronary arteries.

CHD may be treated with medication, surgery, or a combination of both. If you have a heart attack and are admitted to the hospital, your diabetes may be treated with an insulin infusion, possibly followed by insulin injections at home for several months afterward. You may or may not need to remain on insulin in the longer term, depending on your blood glucose levels and other risk factors.

GET EMERGENCY MEDICAL HELP

If you have symptoms of a heart attack:

- Intense pain in the center of your chest that may spread to your jaw, neck, arms, or back, shortness of breath, weakness and/or lightheadedness, sweating, nausea, and sometimes loss of consciousness.

If you have symptoms of a stroke:

- Facial weakness, which may cause drooping of your face, mouth, or eye on one side, drooling, and loss of your ability to smile; weakness or numbness in your arms; problems speaking, such as slurred or garbled speech; and/or confusion and disorientation.

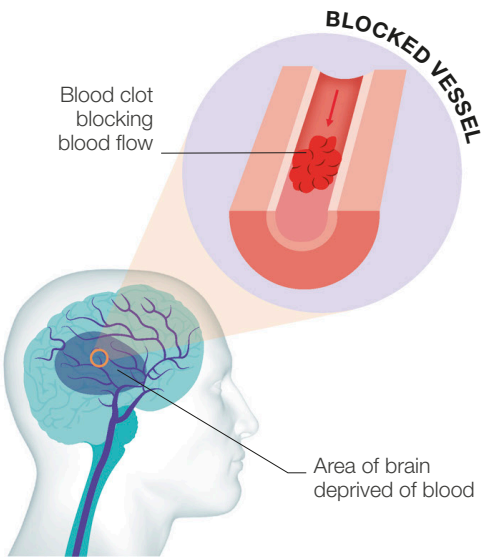
Stroke

A stroke is an interruption to the blood supply to the brain, causing brain cells to be damaged or destroyed. There are two main types of stroke: an ischemic stroke, due to blockage of a blood vessel, and a hemorrhagic stroke, caused by a burst blood vessel.

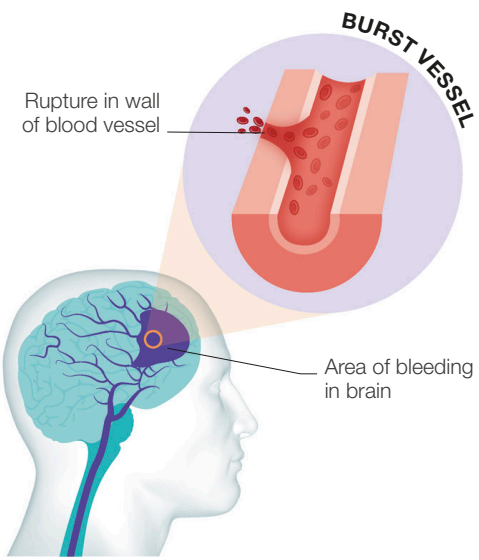
There are two main risk factors for stroke: high blood pressure and atherosclerosis, both of which are more common in people with diabetes. In atherosclerosis, fatty deposits build up inside the arteries and narrow them; a clot may then block the artery. When this happens in an artery that supplies the brain, a stroke occurs. Careful blood glucose management and applying good health principles can reduce your risk of having a stroke (see panel, opposite).

Paying attention to your diabetes and general health can help to reduce your risk of a stroke

The symptoms of a stroke vary according to which part of the brain has been damaged. Movement, speech, memory, vision, hearing, or balance may be affected. Typically, however, symptoms include facial weakness, which may cause drooping of one side of the face, drooping of the mouth, and loss of the ability to smile; weakness or numbness of one or both arms; and speech problems, such as slurred or garbled speech or even a complete inability to speak. A severe stroke may cause unconsciousness and a coma, which may be life-threatening.



△ **Ischemic stroke**
An ischemic stroke is due to blockage of a blood vessel by a clot, formed either in the vessel itself or carried there from elsewhere in the body. Blood cannot reach part of the brain and brain tissue is damaged as a result.



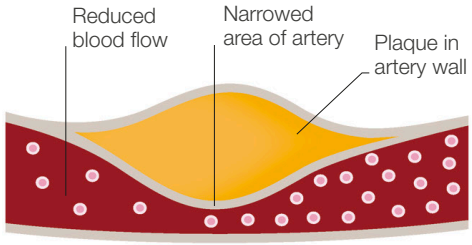
△ **Hemorrhagic stroke**
A hemorrhagic stroke occurs as a result of a ruptured blood vessel and subsequent bleeding on the surface of the brain or within the brain. The blood that accumulates presses on the brain, damaging brain tissue.

A stroke is diagnosed from your symptoms and/or a brain scan. The immediate treatment varies according to the type of stroke but may include medication and/or surgery. Longer-term treatment typically includes rehabilitation therapies, such as physical therapy or speech therapy. Some people make a good recovery, but others are left with long-term problems.

Peripheral vascular disease

In peripheral vascular disease (PVD), fatty deposits (known as atheromas or plaques) in the arteries of the legs or, less commonly, the arms and restrict blood flow. Without treament, PVD may lead to a condition known as peripheral ischemia, in which blood flow to the extremities is severely reduced. This, in turn, may lead to serious complications, such as gangrene (see pp.188-191).

Various factors increase your risk of developing PVD, including a high level of insulin in the blood; a blood glucose level that has been consistently raised for a period of years; high blood pressure (see p.192); and hyperlipidemia (see p.193). Being less active, smoking, and being overweight also increase your risk.



△ **Narrowing of peripheral arteries**
In peripheral vascular disease, fatty plaques in the walls of arteries in the legs and/or arms reduce blood flow, leading to symptoms such as muscle pain and fatigue.

As well as personal action to reduce your risk (see panel, below), it is also important to have your blood pressure and blood lipid levels monitored regularly, and take any necessary treatment for these conditions.

The main sign of PVD is pain and fatigue in the leg or arm muscles during physical activity; typically, the greater the exertion, the greater the pain. PVD is diagnosed from your symptoms and medical history, together with imaging of your arms and/or legs. Treatment is with medication, and sometimes surgery to widen, bypass, or replace affected areas of artery.

REDUCING YOUR RISK OF CARDIOVASCULAR CONDITIONS

The risk of developing cardiovascular problems can be significantly reduced by various health-related measures you can do yourself:

- Healthy eating. Include plenty of fruit and vegetables, and limit the amount of saturated fat and salt in your food.
- Be as physically active as possible.
- Stop smoking.
- If you are overweight, try to lose excess weight (see pp.94–99).
- Pay attention to your diabetes management.
- Drink alcohol within recommended limits.
- Take any medication you have been prescribed to reduce your blood pressure and/or blood lipid levels. If you experience any side effects, report them promptly.
- Try to minimize the effects of stress (see p.111).

Other conditions

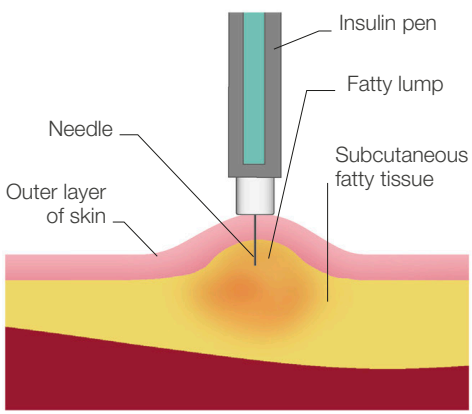
If you have had diabetes for a long time, you are at risk of developing a number of conditions, such as skin problems at injection sites; dental problems; sexual problems; and problems with nerves controlling automatic body functions (known as autonomic neuropathy). The chance of developing these problems can be reduced by careful blood glucose management and a healthy lifestyle.

Lipohypertrophy

Lumpy skin tissue at injection sites is known as lipohypertrophy. The lumps are swollen and raised, but not red or painful. They are due to repeated injections at the same site causing fat deposits to build up under the skin. Insulin can also cause an overgrowth of tissues where the skin has been damaged by injections.

The lumps usually develop slowly, so you may not notice anything wrong. Run your hand across your injection sites to check whether the skin feels different there. If you cannot feel any lumps but your blood glucose fluctuates from day to day for no apparent reason, talk to your health professional. Unpredictable swings in your blood glucose indicate that you may be injecting into sites where the tissue under the skin is abnormal (even though there may be no visible sign of this) and this may be affecting insulin absorption. Your health professional will be able to tell you if you have lipohypertrophy or areas of abnormal skin tissue by examining your injection sites.

To avoid lipohypertrophy, rotate your injection sties (see p.56) and change your needle as recommended. If you already have lipohypertrophy, avoid injecting in the affected areas. If insulin absorption has been a problem, you may need to reduce your insulin dose when you use a new injection site; your health professional will be able to advise. Over time, the lumps should gradually get smaller.



◁ **Lumpy skin**
Damage from repeated injections at the same site, together with the effects of insulin, may cause fatty lumps (lipohypertrophy) to develop under the skin.

◁ **Oral hygiene**
Daily care of your teeth by brushing and using floss or interdental brushes to clean between your teeth can prevent the buildup of plaque and bacteria and reduce the risk of tooth decay and gum disease.

Dental problems

Diabetes carries a risk of developing various dental problems, including gum disease, tooth decay (dental caries), and mouth infections. This is mainly because raised blood glucose can lead to more glucose in the saliva, which provides a good environment for bacteria to thrive in the mouth. The bacteria produce acid, which attacks the teeth and can also lead to gum damage.

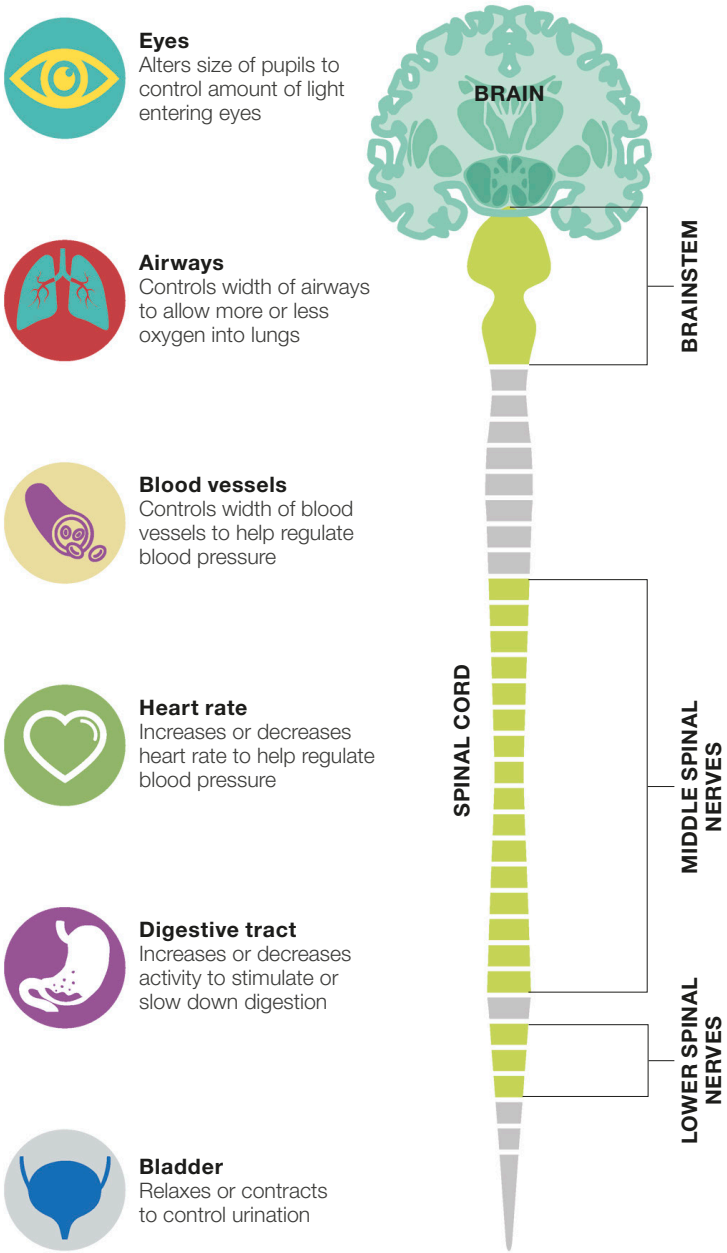
The main early indications of dental problems include abnormal redness and/or soreness of your gums, sensitive or painful teeth, and bad breath. If you experience any of these, see your dentist to get early treatment and help prevent any future problems from developing, such as a severe gum infection, loss of teeth, or both.

Rotating injection sites can reduce the risk of developing lumps at those sites

KEEPING YOUR MOUTH HEALTHY

You can help prevent mouth and tooth problems from developing by following good dental hygiene and careful diabetes management.

- Monitor your blood glucose regularly and try to keep the level within your target range.
- Brush your teeth at least twice a day to minimize plaque buildup.
- Clean between your teeth with floss or interdental brushes to help keep your gums healthy.
- Use a fluoride toothpaste.
- Have regular dental checkups.
- Do not smoke.
- Try to eat food that is low in sugar and contains a variety of fresh fruit and vegetables containing vitamin C, which is essential for gum health.
- If you wear dentures, make sure you clean them frequently.



△ **The autonomic nervous system**
Consisting of nerves coming from your brainstem (at the base of the brain) and the middle and lower parts of the spinal cord, the autonomic nervous system (ANS) automatically controls many basic body functions of the body, such as your heart rate and the activity of your digestive system.

Autonomic neuropathy

The autonomic nerves are those that control parts of your body which you do not move or control voluntarily. They help the body function by regulating your temperature, heart rate, and digestive system, for example. Damage to these nerves is known as autonomic neuropathy, and it can occur through longstanding diabetes or as a result of consistently raised blood glucose over many years. Autonomic neuropathy can produce a range of symptoms, including:

- Too much or too little sweating.
- Nausea, vomiting, diarrhea, or constipation.
- Dizziness (postural hypotension) when you stand up or get out of bed.
- Difficulty exercising because your heart rate does not speed up enough to compensate for increased activity.
- Being unable to empty your bladder completely.
- Erectile dysfunction.
- Reduced awareness of hypoglycemia.

If you develop symptoms of autonomic neuropathy or if it is suspected at your annual physical, your health professional will arrange for various tests to make a definite diagnosis.

You can help to prevent autonomic neuropathy by keeping your blood glucose within your recommended range. If you already have it, specific symptoms are treated as they occur. For example, you may be prescribed medication to lower blood pressure. Nerve damage that has already occurred cannot be reversed but you can reduce the likelihood of the condition progressing by careful blood glucose management, not smoking, eating healthily, and being as active as you can.

AVOIDING POSTURAL HYPOTENSION

There are various measures you can take that may help with postural hypotension.

- When you wake up, sit on the edge of the bed for a few minutes before standing up.
- Get up slowly from sitting to standing.
- Try keeping your head and shoulders raised while you sleep.
- Increase the amount of water you drink.
- Avoid sitting or standing still for long periods.
- Ask your health professional whether wearing supprt stockings at night would help.

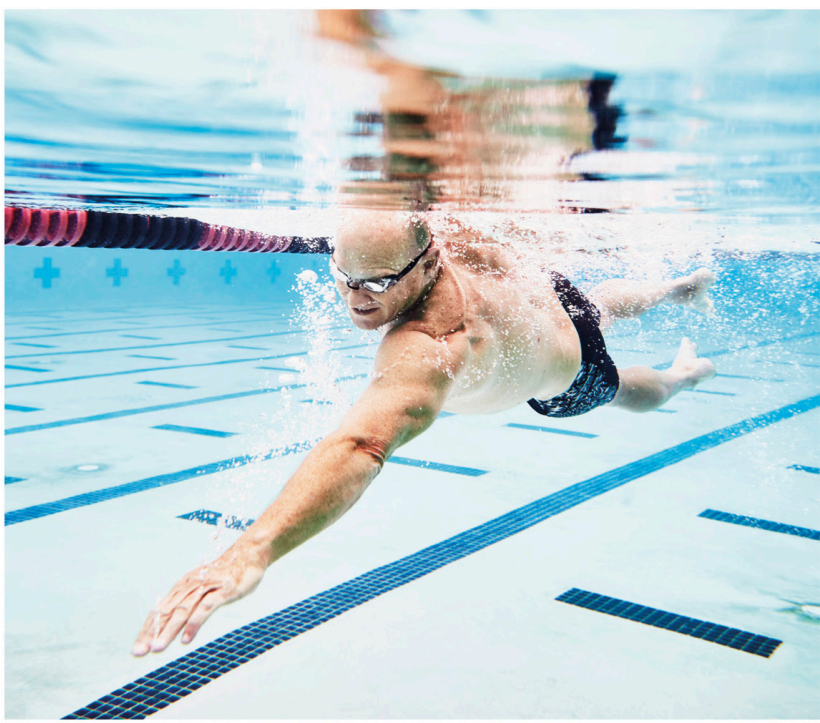
Sexual problems

Having diabetes or high blood glucose for many years can sometimes lead to sexual problems, such as vaginal dryness in women, which can make sex painful or erectile dysfunction (ED) in men. Also sometimes known as impotence, ED is an inability to achieve or sustain an erection. It can be caused by damage to the blood vessels and nerves that supply the penis. There are also many other causes of ED, including certain hormone disorders, side effects of some medications, stress, relationship difficulties, and depression. Your risk of ED is also increased by smoking and alcohol.

Your ED is less likely to be diabetes-related if you have erections at night or in the mornings, if your ED has developed suddenly, or if you only suffer from ED in specific situations, such as when you feel stressed. It is more likely to be linked to your diabetes if you are unable to achieve an erection at all and the problem has developed gradually. If you have repeated episodes of ED, talk with your health professional for a definite diagnosis.

Initial treatment of ED involves identifying and dealing with any underlying cause. Keeping your blood glucose within your target range is very important. Reducing your alcohol intake and stopping smoking will also help. If these measures do not restore full sexual function, you may be offered various treatments, including medication; physical treatments, such as a vacuum pump; or a talking therapy, such as cognitive-behavioral therapy (see p.177). If you choose not to have treatment, ED will not adversely affect any other aspect of your diabetes or your overall health.

▽ **Regular exercise**
Physical exercise not only helps with any circulatory problems but can also help you to control your weight and reduce stress, all of which may be contributing factors to erectile dysfunction.



Information for Canada

Most of the information in this book is applicable to people in Canada, although there are some differences. Following are highlights of information on specific recommendations from Diabetes Canada and other sources.

BLOOD SUGAR TARGETS IN CANADA

	A1C	FASTING BLOOD GLUCOSE LEVEL (MMOL/L)	BLOOD GLUCOSE LEVEL 2 HOURS AFTER A MEAL (MMOL/L)	NOTES
Most people with diabetes	7.0% or less	4.0–7.0	5.0–10.0 (5.0–8.0 if A1c targets not being met)	Alternative guidelines are recommended for elderly individuals based on cognitive ability. A1c of 6.5% or less recommended for some individuals with type 2 diabetes.
People with diabetes younger than 18 years	7.5% or less	4.0–8.0	5.0–10.0	Caution is required to minimize severe or excessive hypoglycemia.

TYPE 2 DIABETES AND INDIGENOUS PEOPLES

Information related to the prevention and screening specifically for type 2 diabetes in Indigenous Peoples can be found on the Diabetes Canada website (www.diabetes.ca). Additional resources are available from the Government of Canada website under Indigenous Services Canada (www.canada.ca/en/indigenous-services-canada.html).

PREVENTING AND REVERSING DIABETES

Diabetes Canada has information on the prevention of diabetes (www.diabetes.ca/) and is partnered with the Canadian Diabetes Prevention Program (www.lmc.ca/diabetes-prevention).

HEALTHY EATING

The official healthy eating guidelines can be found on the government website (food-guide.canada.ca/en/).

WORK

Information about working when you have diabetes can be found on the Diabetes Canada website (https://www.diabetes.ca). Additional information can be found on the Canadian Centre for Occupational Health and Safety government website (www.ccohs.ca/oshanswers/diseases/diabetes.html).

DRIVING

Information about driving when you have diabetes can be found on the Diabetes Canada website and in the Clinical Practice Guidelines (www.diabetes.ca). Reporting may vary in each province/territory.

If your diabetes is treated with insulin secretagogues or insulins, it is recommended that you measure your blood glucose level immediately before driving and every 4 hours while driving. If your blood glucose level is less than 4.0 mmol/L you should not drive, and it is recommended to wait at least 40 minutes after successful hypoglycemia treatment in which your blood glucose has increased to at least 5.0 mmol/L before driving.

KEEPING HEALTHY

Information about health screening can be found on the government website (www.canada.ca), which also provides information on oral health and vaccinations. The Diabetes Canada Clinical Practice Guidelines address additional screening tools (www.diabetes.ca).

BENEFITING FROM HEALTH CARE

Information about health checks for people with diabetes can be found on the Government of Canada website (www.canada.ca) and the Diabetes Canada website (www.diabetes.ca). Speak to your healthcare provider to be referred to a diabetes education centre.

PREGNANCY

Specific guidelines for diabetes management during pregnancy can be found in the Diabetes Canada Clinical Practice Guidelines (www.diabetes.ca). Additional information can be found on the government website (www.canada.ca) and the Society of Obstetricians and Gynaecologists of Canada website (sogc.org/) regarding antenatal tests.

Blood glucose targets during pregnancy are as follows.

- Recommended A1c 6.5% or less, if possible A1c 6.1% or less
- Fasting and before meals—less than 5.3 mmol/L
- 1 hour after meals—less than 7.8 mmol/L
- 2 hours after meals—less than 6.7 mmol/L

TEENAGERS AND YOUNG ADULTS: GETTING ON WITH YOUR LIFE

Information about diabetes care for teenagers and young adults can be found on the Diabetes Canada website (www.diabetes.ca).

BABIES AND YOUNG CHILDREN: DEALING WITH HYPOGLYCEMIA

Based on Diabetes Canada Clinical Practice Guidelines, the amount of carbohydrate required for hypoglycemia treatment may vary based on the weight of your child. Speak to your healthcare provider to determine the required amount. If the child is unable or refusing to take oral carbohydrate, the use of mini-dose glucagon should be considered. Please speak to your diabetes educator for dosing instructions.

In the home situation, severe hypoglycemia in an unconscious child older than 5 years should be treated with 1 mg glucagon subcutaneously or intramuscularly. In children 5 years old and younger, a dose of 0.5 mg glucagon should be given. The episode should be discussed with the DHC team as soon as possible and consideration given to reducing insulin doses for the next 24 hours to prevent further severe hypoglycemia.

Resources

UNITED STATES

Juvenile Diabetes Research Foundation (US)
www.jdrf.org

American Diabetes Association
www.diabetes.org

National Diabetes Education Program
www.cdc.gov/diabetes/ndep/index.html

Association of Diabetes Care and Education Specialists
www.diabeteseducator.org/living-with-diabetes

CANADA

Diabetes Canada Clinical Practice Guidelines
www.diabetes.ca
Information on Diabetes Canada's D-Camps available on this website.

Diabetes Quebec
www.diabete.qc.ca/en
A mission to inform, raise awareness, and prevent through education.

JDRF Canada
www.jdrf.ca
Leader in research funding and advocacy.

Diabetes Hope Foundation
diabeteshopefoundation.com
Scholarship program and peer mentorship program offered. Transition Guide available providing a profile and review of diabetes supports across all post-secondary institutions in Canada.

Connected in Motion
www.connectedinmotion.ca
Support and engagement in diabetes self-management through peer-based experiential diabetes education, sport, and outdoor adventure.

I Challenge Diabetes
ichallengediabetes.org
Fostering type 1 community through adventure to provide skills and confidence to overcome daily challenges.

Diabetes Care Community
www.diabetescarecommunity.ca
Provides high-quality information from healthcare professionals to empower individuals with knowledge and skills to live happy and healthy lives.

Type 1 Together
type1together.ca
Focused on connections, sharing, and advocacy.

Diabetes Advocacy
www.diabetesadvocacy.com
Resource for families, schools, and caregivers to help school-aged children with type 1 diabetes. Layout of financial assistance and provincial assistance programs.

Type 1 Think Tank
type1thinktank.com
Collaboration between individuals living with type 1 diabetes and healthcare providers.

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Page numbers in **bold** refer to a main entry. Page numbers in *italics* refer to illustrations.

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