

blood glucose monitoring

Testing blood glucose levels at home, or self-monitoring blood glucose is a valuable diabetes management tool. You can test your blood glucose levels as often as you need to or as recommended by your diabetes health care team.

Why is it so important to test my blood?

Regular testing and recording of your blood glucose level can help you monitor the effects of your healthy lifestyle choices and inform you of your response to other choices and influences.

Importantly, changes in your blood glucose pattern can alert you and your diabetes health care team to the need for a change in how your diabetes is being managed.

Testing your blood glucose levels will help you to:

- > Develop confidence in looking after your diabetes.

- > Better understand the relationship between your blood glucose levels and the physical activity you do, the food you eat and other lifestyle influences such as travel, stress and illness.

- > Know how your lifestyle choices and diabetes medication, if used, are making a difference.

- > Find out immediately if your blood glucose levels are too high (hyperglycaemia) or too low (hypoglycaemia or 'hypo'), helping you to make important decisions such as eating before exercise, treating a 'hypo' or seeking medical advice if sick. (Refer to the individual information sheets on *Physical activity and type 2 diabetes*; *Hypoglycaemia and diabetes*; *Sick days and type 1 diabetes*; *Sick days and type 2 diabetes*).

- > Know when to seek the advice of your diabetes health team about adjusting your insulin, diabetes tablets, meal or snack planning when blood glucose targets are not being met.

Members of your diabetes health care team such as a diabetes educator can help you to choose the meter that's best for you. Your diabetes educator will also give you all the information you need about how, where and when to test your blood glucose levels. Your diabetes educator can also help you learn how to interpret your blood glucose level and work with you in planning a routine that works for you and the life you lead.



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How do I test my blood?

You will need a blood glucose meter, a finger pricking device with lancets and test strips. The finger is pricked with the lancet to obtain a very small drop of blood which is then applied to a test strip placed in the meter. The results are displayed within seconds.

Blood glucose meters are usually sold as kits giving you all the equipment you need to get started. There are many different types, offering different features and at different prices to meet individual needs. Most of these are available from your State or Territory Diabetes Organisation, pharmacies and some diabetes centres.

What do I aim for?

Diabetes management is all about aiming for a careful balance between the food you eat, how active you are and the medication you take for your diabetes. Because this is a delicate balance, it can be quite difficult to achieve blood glucose levels in your target range all the time.

The normal range of blood glucose levels for a person who does not have diabetes is between 3.5-7.8mmol/L. For some people with diabetes, the ranges will vary depending on the individual and their circumstances. While it is important to keep your blood glucose levels as close to a normal range or non-diabetic range as possible to prevent complications, it is equally important to check with your diabetes health care team for target ranges of blood glucose levels that are right and safe for you. Therefore the following information should be treated only as a general guide.

Targets for glycaemic control

Recommended target ranges for people with diabetes may differ depending on your age, how long you have had diabetes, the type of diabetes medication and any other medication you are taking and if you have any other medical problems. It is strongly recommended that target ranges are developed for each individual person in accordance with their needs and risks. Speak with your doctor and diabetes health care team about your individual target ranges.

Type 1 diabetes ¹	
Target levels	4-8 mmol/L fasting and before meals Less than 10mmol/L two hours after starting meals

All target levels should be discussed with your doctor or diabetes educator.

Type 2 diabetes ²	
Target levels	6-8mmol/L fasting and before meals 6-10mmol/L two hours after starting meals

¹ Target ranges recommended by the National Health and Medical Research Council (NHMRC) 2011.

² Target ranges recommended by the National Health and Medical Research Council (NHMRC) 2009.



People with type 2 diabetes who **are not** at risk of hypoglycaemia from taking insulin or diabetes tablets that make the pancreas produce more insulin could aim for a blood glucose level as close to the normal range as possible.

Risk of hypoglycaemia for both type 1 diabetes and type 2 diabetes

Less than 4mmol/L – if taking insulin or certain types of diabetes tablets that make the pancreas produce more insulin. If you are unsure about what type of diabetes tablets you are taking, check with your doctor if the risk of hypoglycaemia applies to you.

Who is at risk of LOW blood glucose?

- People who are using insulin or taking diabetes tablets that make their pancreas produce more insulin **are** at risk of low blood glucose levels or hypoglycaemia. These medications can cause hypoglycaemia when blood glucose levels are less than 4mmol/L. But, hypoglycaemia can sometimes occur at higher blood glucose levels, especially in children, older people and people who have had elevated blood glucose levels for a long time.
- People **are not** at risk of hypoglycaemia when their diabetes is managed by lifestyle alone or with diabetes tablets which do not increase their own insulin production.

Are HIGH blood glucose levels dangerous?

Sometimes you may get a higher blood glucose reading than usual and you may not be able to figure out the reason. When you are sick with a virus or flu, your blood glucose levels will nearly always go up and you may need to contact your doctor, especially if you have type 1 diabetes and have ketones in your blood or urine. It is only when blood glucose levels are higher than they ought to be over weeks or months that long term health complications from diabetes occur.

What causes glucose levels to go up and down?

There are a number of common causes for glucose levels to increase or decrease. These include:

- | | |
|--|---------------------|
| > Food – time eaten, type and amount of carbohydrate (eg: bread, pasta, cereals, starchy vegetables, fruit and milk) | > Illness and pain |
| > Exercise or physical activity | > Alcohol |
| > Diabetes medication | > Other medications |
| > Emotional stress | |
| > Testing techniques | |

When should I test?

Your doctor or diabetes educator will help you decide how many tests you need to do, when to test and the target range you should aim for.

You may also be advised to record all your tests. Even though your meter may have a memory, it may be important to keep a record of your readings in a diary and to take this with you to all appointments with your diabetes health care team. Most meters on the market have software which allows you to download your records in different formats such as graphs and charts to print out for your appointment. Some mobile phones ('smart phones') enable you to store your results on your phone. Even if you can do this, it can still be helpful to keep a diary, not only for your tests but also details of your daily activities, the food you eat and other relevant information. This will provide both you and your diabetes health care team with important information in deciding if and how your management and medication may need to be adjusted.

Ask your doctor or diabetes educator how you can use a diary to help you to better manage your diabetes.

General guidelines

- How often you should test will depend on your diabetes management and diabetes medication. Ask your doctor or diabetes educator to help you develop a testing pattern that suits your diabetes and the life you lead.

Some testing times are:

- > before breakfast (fasting)
- > two hours after a meal
- > before bed
- > before lunch and dinner
- > when feeling unwell

- Testing four times a day is usually recommended for people with type 1 diabetes. However many people test more often, for example, those using an insulin pump (CSII – continuous subcutaneous insulin infusion).

Test more often when you are:

- > Being more physically active or less physically active
- > Sick or stressed
- > Experiencing changes in routine or eating habits eg: travelling, starting a new job
- > Changing or adjusting your insulin or medication
- > Experiencing symptoms of hypoglycaemia
- > Experiencing symptoms of hyperglycaemia
- > Experiencing night sweats or morning headaches



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What if the test result doesn't sound right?

If you're not convinced that a result is correct, here's a suggested check list:

- > Have the strips expired?

- > Is the strip the right one for the meter?

- > Is there enough blood on the strip?

- > Has the strip been put into the meter the right way?

- > Have the strips been affected by climate, heat or light?

- > Did you wash and thoroughly dry your hands before doing the test?

- > Is the meter clean?

- > Is the meter too hot or too cold?

- > Is the calibration code correct?

- > Is the battery low or flat?

All meters will give a different result with a different drop of blood. As long as there is not a big difference (more than 2mmol/L) there is not usually cause for concern.

The accuracy of all meters can be checked with meter-specific liquid drops called control solutions. These are expensive, have a short shelf life and only last a few months once opened. However, your diabetes health care team or pharmacy may be able to do this for you at no charge.

What is a glycosylated haemoglobin (HbA1c) test?

The HbA1c test shows an average of your blood glucose level over the past 10–12 weeks and should be arranged by your doctor every 3–6 months.

Is the HbA1c the same as testing your own blood glucose?

No. The HbA1c test doesn't show the highs and lows that your own testing shows. Therefore it does not replace the tests you do yourself but is used as an added tool in giving the overall picture of your blood glucose management.

How does it work?

Red blood cells are continuously being made by your long bones and released into your circulation, or blood stream. When these cells are released, they pick up glucose in the blood stream. An HbA1c test measures the amount of glucose that the red cells have picked up.

Each red blood cell lasts about 120 days (10-12 weeks). Therefore any blood sample will have a range of cells released over the previous 120 days with different amounts of glucose attached. The HbA1c test gives a good guide to the average.

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What HbA1c do I aim for?

The general target for most people with diabetes is less than 7% or 53mmol/mol. Some people may aim for a lower target, but others may need it to be higher, for example children and the old and frail. Your doctor will advise you of the HbA1c target that is right and safe for you.

How is HbA1c reported?

The way that HbA1c is reported is changing. HbA1c has been expressed as a percentage (%). From 2011, it has also been reported as mmol/mol. HbA1c will continue to be reported as both mmol/mol and % for some time.

HbA1c %	6	7	8	9	10
HbA1c mmol/mol	42	53	64	75	86

More information

Many hospitals have a diabetes clinic where you can find out more about blood glucose monitoring. Contact your:

- > Local hospital for your nearest diabetes clinic or
- > State or Territory Diabetes Organisation on 1300 136 588

Would you like to join Australia's leading diabetes organisation?

- > Dietary services
- > Free magazines
- > Children's services
- > Educational literature
- > Product discounts
- > Support groups

For more information phone **1300 136 588** or visit your State/Territory Organisation's website:

ACT	www.diabetes-act.com.au	NSW	www.australiandiabetescouncil.com
NT	www.healthylivingnt.org.au	QLD	www.diabetesqueensland.org.au
SA	www.diabetessa.com.au	TAS	www.diabetestas.com.au
VIC	www.diabetesvic.org.au	WA	www.diabeteswa.com.au

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