



# HELLO

The Diabetes Service at Perth Children's Hospital and the Children's Diabetes Centre at the Telethon Kids Institute have created this folder to provide information for children and families on all aspects of managing and living with Type 1 Diabetes.

If you need to contact a diabetes educator, endocrinology liaison nurse or healthy weight service at Perth Children's Hospital, please call **6456 1111** during office hours [Monday to Friday 8:30 am to 4:30 pm].

### Should you require emergency assistance:

<b>Ambulance</b> <b>000</b>	<b>PCH Emergency Diabetes Doctor</b> <b>6456 5993</b> <i>Weekends and after hours</i>
<b>PCH Diabetes Department</b> <b>6456 1111 Select option 2</b> <i>Monday to Friday 8:30 am to 4:30 pm</i>	<b>PCH Switchboard</b> <b>6456 2222</b> <i>Ask for on-call endocrinologist</i>



An online version of this folder, additional information on diabetes care, videos, newsletters and information on diabetes research are available online:

Perth Children's Hospital website:

[www.pch.health.wa.gov.au/Our-services/Endocrinology-and-Diabetes](http://www.pch.health.wa.gov.au/Our-services/Endocrinology-and-Diabetes)

Children's Diabetes Centre website

[www.childrensdiabetescentre.org.au](http://www.childrensdiabetescentre.org.au)

## BE INVOLVED

The Diabetes Service at Perth Children's Hospital and the Children's Diabetes Centre at the Telethon Kids Institute are involved in community support programs and research projects with the aim of improving the lives of all children with diabetes.

There are many ways you can be involved including supporting your child to participate in research studies, joining our diabetes community group and signing up for our newsletter. Further information is available on the Children's Diabetes Centre website.

If you would like to be involved, please email us at [diabetes.research@health.wa.gov.au](mailto:diabetes.research@health.wa.gov.au)



Government of Western Australia  
Child and Adolescent Health Service



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Newly Diagnosed  
Type 1 Diabetes



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# WHAT IS DIABETES?

**Diabetes** is the term given to conditions where there are elevated glucose levels in the blood. There are many different types of diabetes, with the main ones being type 1, type 2 and gestational diabetes. The reason for high blood glucose levels is different for each type of diabetes, and this is important because the treatment for each type is different. In children, the most common type of diabetes is type 1 diabetes.

## 1.1 WHAT IS TYPE 1 DIABETES?

- **Type 1 Diabetes** is a **non-preventable disease** and is **NOT caused by eating too many sugary foods. This means it is not your fault.**  
It used to be known as: **juvenile diabetes or insulin dependent diabetes**
- **In type 1 diabetes**, the body's immune system gets confused and attacks and kills the beta cells of the pancreas, like it would a virus or bacteria when we're sick. This is why type 1 diabetes is called an **autoimmune disorder**.
- **The beta cells of the pancreas are responsible for producing a hormone called insulin.**

### Insulin

Insulin acts like a key to unlock your cells which lets the glucose be used for energy.



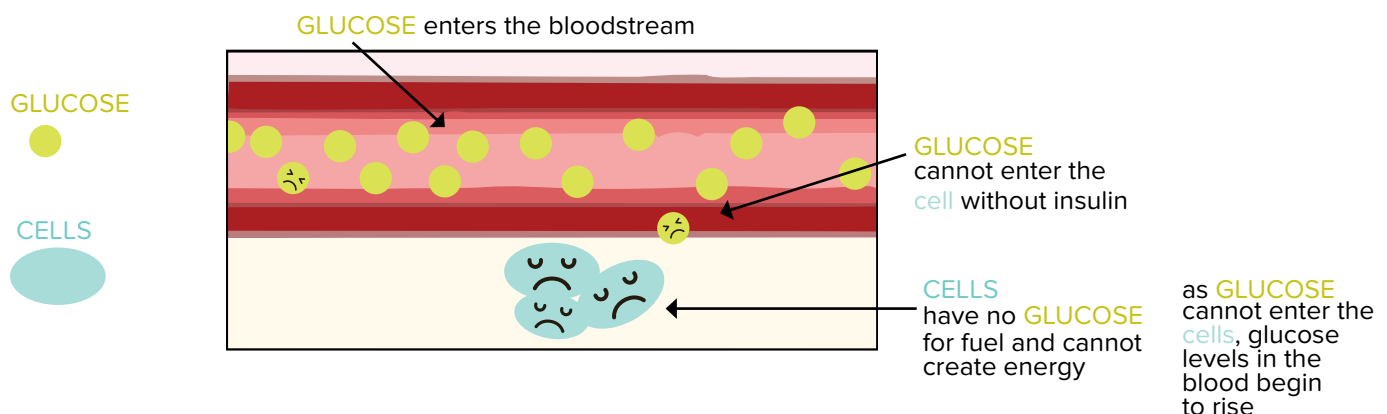
### Glucose

Comes from the carbohydrate-containing foods we eat and is our body's preferred source of energy.



Insulin is vital in the growth and development in children (see Section 8: **Food planning** for more information)

Without insulin, the glucose levels in the blood rise uncontrollably (because it is unable to enter the cells) and the body is not able to use it as energy.





- Type 1 diabetes that is well managed **does not decrease your child's potential** and children with diabetes are **still able to participate in activities, including sport.**

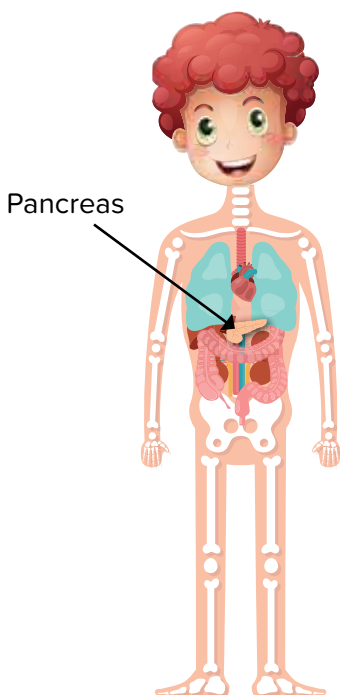


- The key to **understanding how to keep things in balance** is through **knowledge and continued education.**



## 1.2 TREATMENT

**The treatment of type 1 diabetes** involves taking over the job of the pancreas by aiming to keep blood glucose levels as close to target range as possible.



This involves:

- 1 The administration of insulin-** People with type 1 diabetes require insulin through injections or an insulin pump and need to regularly test blood glucose levels by pricking a finger or using continuous glucose monitoring.



- 2 Keeping a healthy lifestyle-** This includes physical activity and a healthy balanced diet. The amount of carbohydrates in food needs to be considered in order to give the correct insulin dose.



## 1.3 THE DIABETES TEAM

**When a child is newly diagnosed with type 1 diabetes,** the diabetes team will meet with you and plan education sessions during your stay in hospital.

They will teach you:

- How to **give insulin**
- How to **monitor glucose levels**
- How to **manage diabetes** in day-to-day life



The purpose of this guide is to give you **written information for you to refer to once you are back at home**

**Once discharged,** the team will plan outpatient visits to build on the knowledge that you have learnt and to monitor your child's progress.

The team comprises of:



Specialist paediatric diabetes doctors called **endocrinologists**



Nurse practitioners



Teacher liaison team



Dietitians



Psychology liaison team



Diabetes nurse educators



Social workers



**The diabetes team** will continue to provide ongoing education and support to ensure you are able to self-manage type 1 diabetes successfully.

Your child will be seen **4** times a year from the ages of **0-18 years** to:

- **help care for your child** with diabetes
- **monitor** their growth and development
- **and** ensure your family is up-to-date with the latest in **diabetes management**

**Our diabetes team** also provides out of hours emergency support.

Please call the **emergency doctor on 6456 5993** or the **PCH switchboard on 6456 2222**.

## Key messages

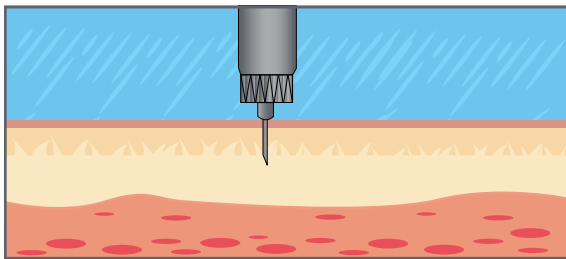
- ❑ **There are different types of diabetes.**
- ❑ **Type 1 diabetes is an autoimmune disorder where the beta cells of the pancreas are targeted and attacked by the person's immune system.**
- ❑ **The beta cells are responsible for producing insulin.**
- ❑ **Insulin is a hormone that is vital for allowing the glucose in our blood into our body's cells to produce and use energy.**
- ❑ **Glucose comes from the food we eat. It is also made by the body. It is the preferred source of energy and is vital for growth in children.**
- ❑ **In type 1 diabetes, because the beta cells have been destroyed, there is no insulin production by the pancreas which results in elevated blood glucose levels.**
- ❑ **Therapy includes giving insulin, monitoring blood glucose levels, healthy eating and physical activity.**
- ❑ **The diabetes team is a multidisciplinary team who will help guide and support you through your diabetes journey.**

# INSULIN

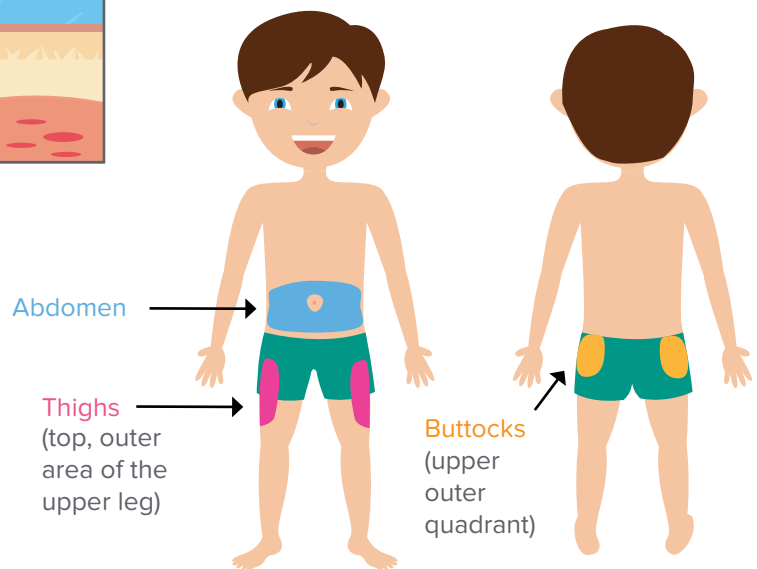
**When a person has type 1 diabetes,** insulin needs to be administered via injections, or an insulin pump, to replace the insulin that is not being produced by the pancreas. Unfortunately, due to the structure of insulin, it cannot be made into any other forms, such as a tablet or oral liquid.

## 2.1 INSULIN INJECTIONS

- **Insulin is injected under the skin,** into the fat (known as the subcutaneous layer), where it is absorbed into the bloodstream.



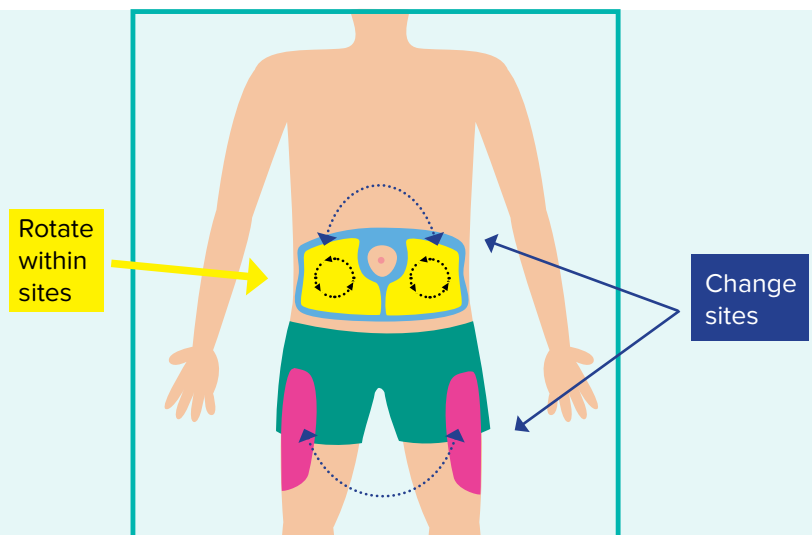
The 3 main sites for injection used in children are:



It is very important to rotate between injection sites and within previous injection sites.

Fatty lumps (called **lipohypertrophy**) can occur when insulin is repeatedly injected into the same area. This will affect insulin absorption.

If **lipohypertrophy** occurs, **stop injecting into these areas immediately.** The lumps should go away over a period of a few months.



## 2.2 PENS

**Insulin pens** are either:

### Disposable:

- Are prefilled with insulin.
- They can be disposed of into the household rubbish (with needle detached) when either the insulin has run out or if it has been out of the fridge longer than a month, whichever occurs first.

OR

### Non-disposable:

- Require you to load a penfill cartridge into the pen before use.
- The pen should not be thrown out.
- The penfill needs to be removed and thrown into a sharps container once empty or if it has been out of the fridge longer than a month. A new cartridge then needs to be loaded.

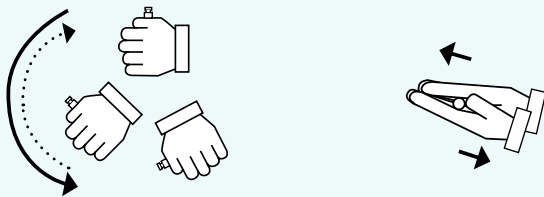
Your diabetes educator can provide you with non-disposable pens.

Whether you use a disposable or non-disposable pen is a personal choice and your team can help you decide which option is better for you. Some non-disposable pens can deliver in 0.5 unit increments which may be more suitable for younger children, or those in 'honeymoon phase'.

Insulin is measured in units. One millilitre (mL) of insulin contains 100 units. The penfill cartridges and disposable pens hold 3mL of insulin (300 units). Insulin is also available in larger vials which hold 10mL (1000 units) – some people on insulin pumps may prefer to purchase larger vials.

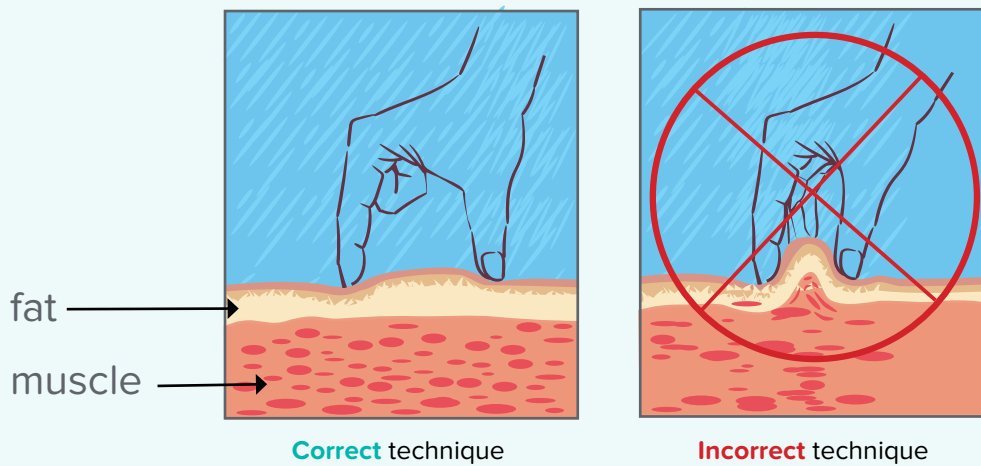
### How to do an insulin injection:

- 1 Wash and dry hands.
- 2 Collect **equipment** (■ insulin pen ■ alcohol swab ■ needle ■ sharps container ■ penfill cartridge for non-disposable pen if required).
- 3 Check the **expiry date** and ensure there is **enough insulin left** in the pen for the injection.
- 4 If using a **cloudy insulin**, **mix insulin** by tipping the pen gently up and down, or rolling between your hands until the insulin is re-suspended.

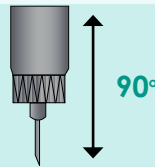


- 5 Wipe end of pen with alcohol swab to disinfect rubber tip.
- 6 Attach needle and pull off outer and inner caps. **Ensure a new needle is used with each injection.**
- 7 Prime the pen by dialling up 2 units of insulin and press the injection button fully. Continue to repeat this procedure until you see drops of insulin at the tip of the pen needle. **Ensure a successful prime has occurred before proceeding with the injection.**
- 8 Use the dose selector to **dial up the number of units you need to inject**. If a larger dose is accidentally dialled up, do not inject the dose. The pen can be dialled backwards.
- 9 Place pen in **preferred hand** and **curl fingers around pen barrel**, with your thumb near injection button and needle pointing towards the injection point.

- 10 Hold the skin using your index finger and thumb at the chosen site.



- 11 Insert needle through the skin at a **90-degree angle**, firmly but gently.



- 12 Fully depress the injection button, and hold.

- 13 Count to 10.

- 14 Relax the skin and withdraw needle. Detach needle by placing the outer cap over the needle and unscrew. **Never store an insulin pen with a pen needle attached.**

- 15 Dispose of pen needle into sharps container and store pen in case.



You can view an instructional video here:

<https://www.youtube.com/watch?v=VVKnBOQyHLE>



Please refer to **pictorial guides for specific pen manufacturer instructions**. This will be given to you by your diabetes educator.

## 2.3 TIPS

- Occasionally an area will bleed slightly or bruise, and this is not harmful. A tense area will bruise more readily, so it is best to relax the area.
- Insulin sometimes leaks out when the needle is withdrawn from the skin. If this happens, ensure you are counting to 10 before withdrawing the needle, or try injecting more slowly.
- Insulin is best injected at room temperature for comfort.
- If your child is experiencing any difficulties with the injections, for example refusal or pain, speak to your diabetes team so they can help address the issue as soon as possible.



## 2.4 STORAGE

Insulin that is in use can be kept out of the refrigerator in a cool, dark place. Ensure you note the date you open each pen/cartridge because it is only valid for one month once opened. It is important that the insulin is not exposed to extreme conditions (too hot or too cold), as this can affect its effectiveness.

Insulin that is not in use, or is spare, will last until the expiry date when stored in the refrigerator (2-8 degrees Celsius).

Unopened insulin must not be used past its expiry date.

Insulin should never be:

frozen



shaken vigorously



exposed to direct heat or sunlight



Do not use insulin if:

- ⊗ the clear insulin has turned cloudy
- ⊗ the cloudy insulin will not re-suspend
- ⊗ it is discoloured
- ⊗ it contains lumps or flakes
- ⊗ it is past its expiry date

## 2.5 INSULIN ACTION

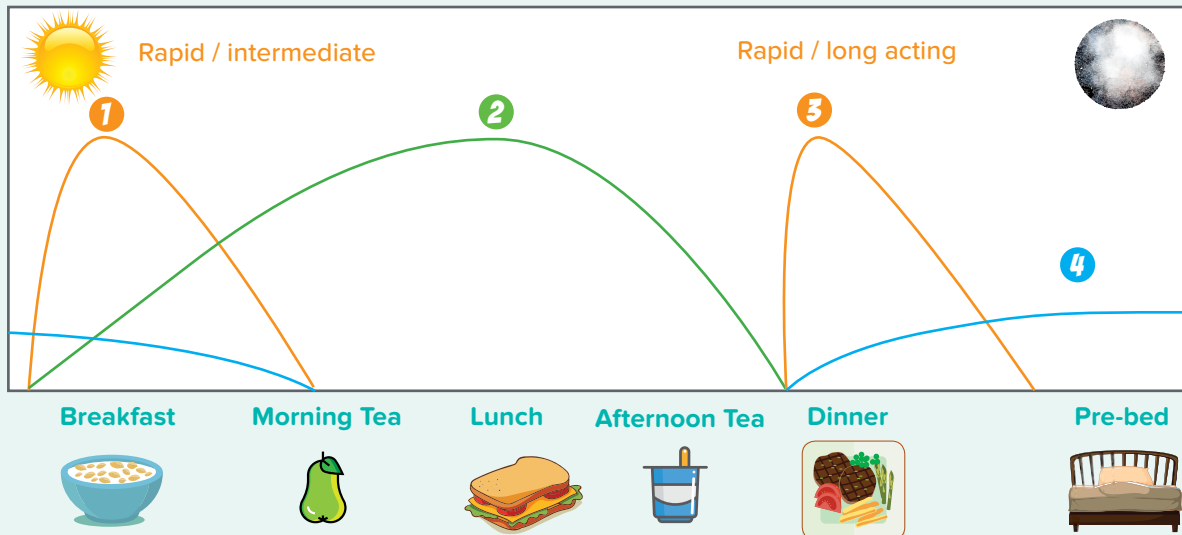
There are various brands and types of insulin available. They are all identical in structure to human insulin despite being made synthetically. Below is a table of commonly used insulin at Perth Children's Hospital.

Insulin Type	Preparations	Onset of action	Peak of action	Duration of action
<b>Rapid acting</b> (clear)	Humalog NovoRapid	0-15 mins	1-1½ hrs	3-5 hrs
<b>Intermediate acting</b> (cloudy)	Protaphane Humulin NPH	1 hour	4-12 hrs	16-24 hrs
<b>Long acting</b> (clear)	Lantus	2-4 hrs	No peak	24 hrs
	Detemir Levemir	1 hour	3-14 hrs	Up to 24hrs

➤ The **type of insulin used** depends on the **insulin regimen prescribed**.

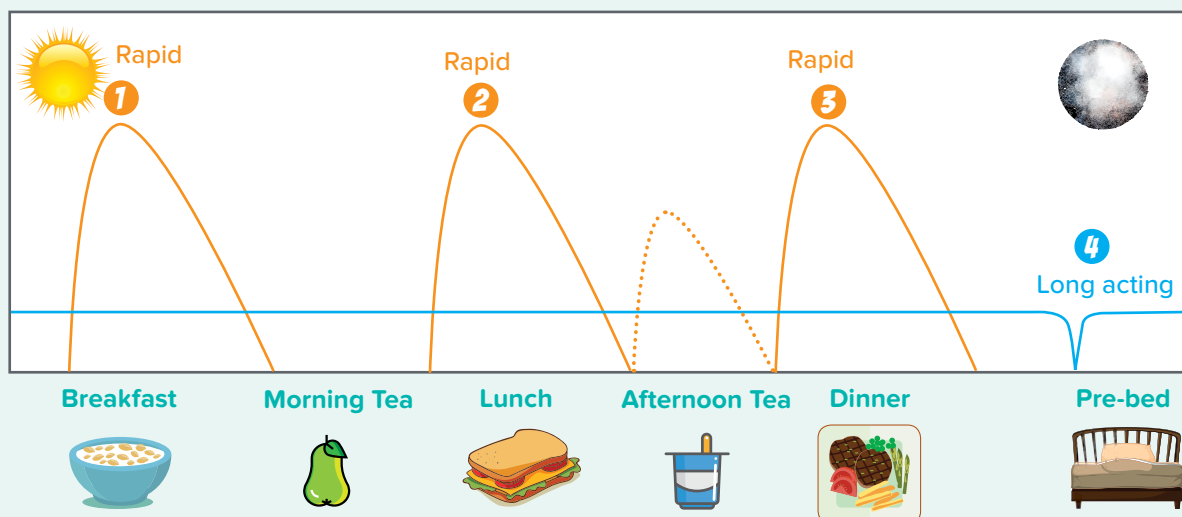
## Twice Daily Insulin injections

- A **1** rapid-acting insulin and **2** intermediate-acting insulin in the morning **before breakfast**
- A **3** rapid-acting insulin and a **4** long-acting insulin at night **before dinner**
- This regimen can result in high Blood Glucose Level (BGL) in the afternoon and an afternoon tea injection may be needed to help maintain BGL targets
- A strict routine and consistency in carbohydrates is required for stable BGL



## Multiple Daily Injections (MDI)

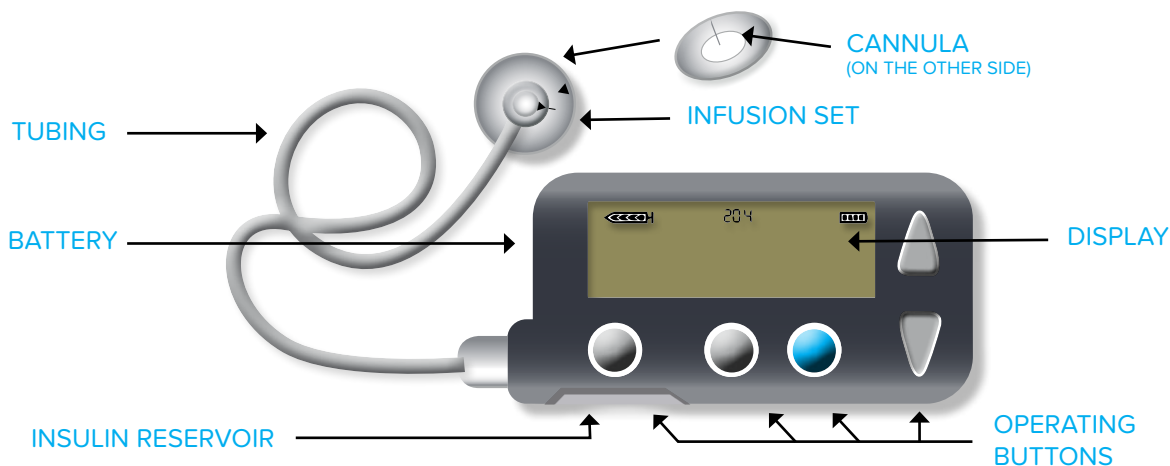
- A **1** rapid-acting insulin **2** prior to all main meals **3**
- A **4** long-acting insulin at night usually before bed
- The preferred insulin injection regimen to achieve BGL targets but does require a lunchtime insulin injection to be facilitated. It allows for greater flexibility. There is also scope for an afternoon tea injection.



## 2.6 INSULIN PUMP THERAPY

Insulin pump therapy is a treatment choice for patients with diabetes. Instead of multiple daily injections, insulin is delivered to the patient via a small, battery-operated device – small enough to fit into the palm of your hand. **The pump is made up of:**

- 1 The pump itself, which is individually programmed to deliver insulin.
- 2 An insulin reservoir which is housed inside the pump. It can hold anywhere between 150-300 units of rapid-acting insulin.
- 3 Tubing which connects the pump to the infusion site. The tubing is available in varying lengths.
- 4 An infusion site that is placed on the skin with a waterproof dressing. Underneath the dressing, a cannula sits in the fat layer under the skin where insulin is delivered and absorbed. This infusion site requires changing every two to three days.



\* **Please note:** Pump technology is always changing so please check with your clinic team as to what pumps are currently available.

At this point in time, the pump is **not** a fully automated system. It still requires the user to enter information such as:

- **The amount of carbohydrates about to be eaten** - therefore carbohydrate counting is an essential skill.
- **The current blood or sensor glucose level** – meaning blood glucose monitoring and finger pricks still may be required.

Some pump brands can pair with a separate technology called Continuous Glucose Monitoring (CGM) (please refer to **Section 3** for more information).

**Regular review is required to ensure the programmed pump settings are adequate for the user** – this is especially the case when a person is **under 18 years of age** and may still be undergoing periods of growth and development. Insulin pump settings may need to be reviewed and adjusted as often as every **2-4 weeks** in some cases to fit the person's changing insulin requirements.

The pump is able to fine-tune insulin delivery and can deliver insulin amounts as small as 0.01 units. Because of this ability, it can very closely mimic the pancreas, resulting in the ability to achieve finer blood glucose control. The pump is completely programmable and delivers insulin in two ways:

- **Basal insulin:** The pump delivers a small amount of insulin (as would the pancreas) according to the programmed settings based on the person's insulin requirements without food. Different basal rates can be programmed for different times of the day as needed. Automated basal delivery systems can alter the amount of insulin delivered in response to sensor glucose levels.
- **Bolus insulin:** To give a dose (or "bolus") of insulin to cover carbohydrate intake or to bring a person's high BGL back to target. The pump can calculate how much insulin is required as a bolus when provided with a blood or sensor glucose level and amount of carbohydrate being consumed.

## 2.7 Why choose insulin pump therapy?

- Ability to achieve **better blood glucose control** and reduce the risk of long-term complications.
- Reduced rate of **acute hypoglycaemia**.
- Increased ability for **flexible lifestyle**.
- **Removes the need for multiple daily injections** that can help with improved quality of life and burden of disease.
- **Can help with:**
  - managing exercise
  - bolusing for low GI foods or foods containing fat and / or protein
  - hypo unawareness
  - gastroparesis

## 2.8 Things to consider

- Insulin pump therapy can be challenging with the need to carbohydrate count and regularly review insulin pump settings.
- The person with diabetes should want to be on insulin pump therapy. It is important to have this conversation with your child if they are old enough.
- It does not remove the requirement of blood glucose monitoring at this time but can reduce it when used with an approved CGM system.
- The cost of consumables is about \$30-\$40 / month.
- The pump ideally needs to be attached at all times. However, it can be detached for exercise, baths, showers and swimming. It should not be detached for more than 2 hours.
- The insulin pump only delivers rapid-acting insulin. If the pump is disconnected or if the **flow of insulin is interrupted for more than 3-4 hours, diabetic ketoacidosis (ketones) can develop quickly**.
- Computer and internet access is required so that you can upload your insulin pump data for review of settings.

## 2.9 Interested in pump therapy? Here's what to do:



**Think about which pump brand you would like to use.**

This is your decision made with the support of the clinic team.

The main pumps seen in our clinics include:

1

**MEDTRONIC**

**Website** • [www.medtronic-diabetes.com.au](http://www.medtronic-diabetes.com.au)

2

**Tandem t:slim - Australasian Medical and Scientific Ltd**

**Website** • [www.amsl diabetes.com.au/item/t-slim-x2-insulin-pump](http://www.amsl diabetes.com.au/item/t-slim-x2-insulin-pump)

3

**YpsoPump - Ypsomed Delivery Systems**

**Website** • [www.ypsomed.com/en-AU/](http://www.ypsomed.com/en-AU/)

4

**ROCHE DIAGNOSTICS: Accu-chek**

**Website** • [www.accu-chek.com.au](http://www.accu-chek.com.au)

**Do your own research.** It is advised to complete the online learning packages so that you have a full understanding of the pump's capabilities. You can also speak to your health care team if you have any further questions.



**Speak to your private health insurance company**

Once you have decided on the type of pump you would like to use, it is important to speak to your private health insurer to see if your child's current level of cover will purchase the insulin pump.

If your child's health insurance is yet to reach its maturation date or if you have just applied for health insurance, you may be eligible for a loan pump until your health insurance matures. You will need proof of health insurance commencement, and level of cover.

Please speak to your **diabetes team** if you are unable to afford private health insurance.



## Interested in pump therapy? Here's what to do (continued):



Speak to your diabetes educator

The transition to insulin pump therapy can be overwhelming. Your diabetes educator will be able to provide you with advice to ensure this transition process is as smooth and stress-free as possible.

Once you and your team feel like you are ready for [insulin pump therapy](#), you will need to complete [insulin pump application paperwork](#). This includes:



**Insulin pump choice and checklist** form



**Insulin pump order** form



**Health insurance** form (if applicable)



Your completed **application is then submitted**.



Then you will be **placed on the pump waitlist**. Pump waitlist times can vary.



You will be **contacted by the pump administration team** once you have **reached the top of the waitlist** to organise education dates and pump start.

- GLUCOSE MONITORING
  - BLOOD GLUCOSE MONITORING
  - CONTINUOUS GLUCOSE MONITORING
  - FLASH GLUCOSE MONITORING

# GLUCOSE MONITORING

There are different ways of measuring blood glucose.

**Blood glucose (BG) monitoring** is the measurement of glucose in the blood from a finger prick capillary sample that is measured by a glucose meter.

**Continuous glucose monitoring (CGM)** systems are available and are described later in this chapter.

**Flash glucose monitoring (see description at end of section).**

**Blood glucose monitoring is essential to manage your diabetes.** Some of the reasons include:

- To learn about **patterns or trends in your glucose levels.**
- To **adjust your insulin doses.**
- To recognise **hypoglycaemia (low levels)** and **hyperglycaemia (high levels).**
- To **monitor glucose levels** when your activity changes e.g. exercise, sport.
- When **eating different foods.**
- On days when you may be **unwell** e.g. colds, flu, upset stomach.

## 3.1 What supplies do I need to check my blood glucose levels (BGL)?

- First you need to **register** with the **National Diabetes Services Scheme (NDSS)**. Your diabetes educator will help with this. *This allows you to buy supplies at a lower cost.*



[www.ndss.com.au](http://www.ndss.com.au)



- NDSS sub-agent pharmacies sell meters and other supplies.



<http://osd.ndss.com.au/search/>

SEARCH FOR HEALTH PROFESSIONALS  
or ACCESS POINTS

- You will get your **first meter when you are in hospital.** *Some private health insurance funds (extras cover) may cover the cost if you buy another meter later.*

## 3.2 Steps to check your BGL

- 1 Wash hands with warm water and soap (if available) and dry well.
- 2 Prepare your meter, strips (ensure they are in date) and lancet. **Remember to set the gauge depth on your lancet device to your chosen level. A new lancet should be used everyday.**
- 3 Place strip in the meter.
- 4 Prick the tip of the finger on the side. Fingertips are the preferred site for testing for accuracy. **It is advised NOT to use toes.**
- 5 Relax your arm by your side and **gently massage** with the hand from the base to the tip of the finger (a drop of blood should appear).
- 6 Touch the test strip to the blood until it has absorbed enough.
- 7 The meter will count down and then show the result.
- 8 Record the level in your record book or pump.
- 9 Discard the used test strip.

## 3.3 When and how often should I check my BGLs?

- > At first, more frequent BG checks are needed to work out your insulin doses.
- > We recommend **at least 4 – 8 checks per day.** Sometimes overnight testing will also be required.
- > You should always check your BG if you are feeling **“low” (hypoglycaemic)**, unwell, or **“high” (hyperglycaemic).**
- > You should always check your glucose level **before meals and giving insulin.**
- > You should always check your glucose level **before and during exercise.**
- > A glucose check **before going to bed** is important.



## 3.4 Disposal of equipment

- > Test strips can be put into rubbish bins.
- > Any exposed lancets need to be put into an **approved sharps container.**
- > Full sharps containers may be taken to an **NDSS sub-agency/pharmacy or the local shire or city council for incineration.**
- > In country regions, full sharps containers may be disposed of at the **local district or regional hospital.** **DO NOT place sharps directly into the rubbish.**



### 3.5 What glucose target should I aim for?

- In Australia, a BG is measured in millimoles of glucose per litre of blood (mmol/L). It is important to make sure that your meter is set to read BG in mmol/L.
- In a person without diabetes, the range is between 3.5 mmol/L and 8.0 mmol/L. In a person with diabetes,

**we aim for between 4.0 mmol/L and 8.0 mmol/L before meals.**

- **Post meal reading should be between 4-8 mmol/L.**

- **7-day average should be 8 mmol/L.**

- BGLs will continually fluctuate and it can be difficult to keep within this range all the time.
- There are many factors that will affect your BGL and it is important to maintain a healthy lifestyle.
- Remember, **you can't fail a blood glucose check**—you succeed by getting the information about your BG number – high, low or within range.
- If many readings are outside the target range, then it may mean that changes are required around insulin, exercise or activity levels, and food.



### 3.6 What if I have unexplained out of target readings?

- Are the strips past their **expiry date**?
- Have the strips been **affected by heat, light or humidity**?
- Did you **wash and dry your hands first**?
- Is there **enough blood on the strip**?
- Do the **batteries in the meter need changing**?
- Are you **using different meters**?

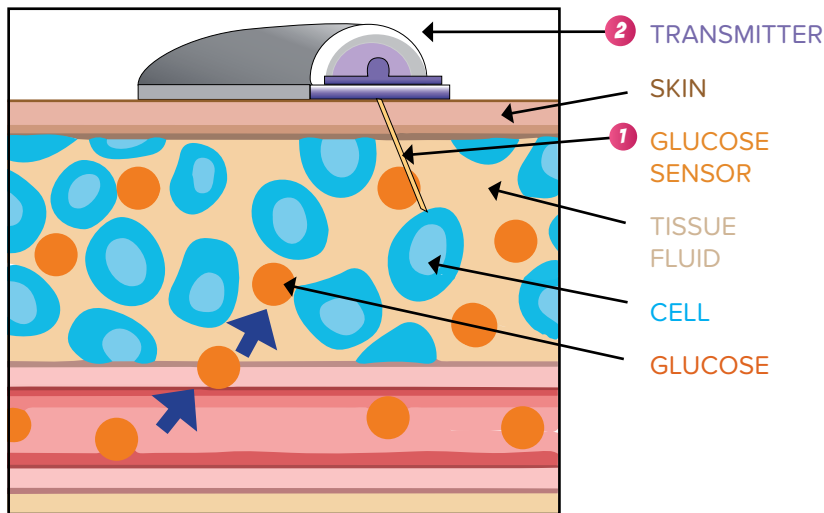


Contact the company toll-free number listed in the meter's manual or warranty for further help.

# CONTINUOUS GLUCOSE MONITORING

Continuous glucose monitoring (CGM) systems are a way to monitor glucose levels continuously through a sensor. There are several companies providing this type of technology.

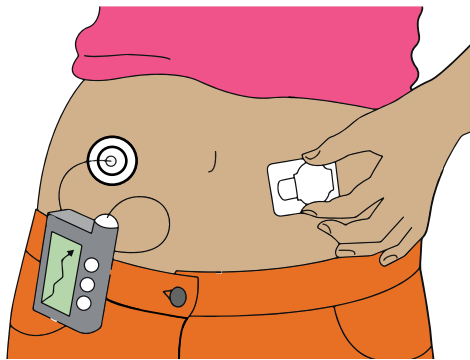
CGM systems have three parts:



1

The **sensor** - is inserted under the skin by a parent or young person with type 1 diabetes, and has a very small foil that measures glucose levels in the tissue fluid. This may then require calibrating against a blood glucose level at least every 12 hours. The sensor is about the size of a 50 cent piece, and the filament that goes under the skin is about 1 cm in length. The sensor stays in for 6-14 days.

- 2 The **transmitter** - attaches on top of the sensor and sends the sensor glucose readings to a receiving device.
- 3 The **receiving device** can be (i) a remote device, (ii) an insulin pump, or (iii) an app on a smartphone.



## 3.7 Why choose CGM?

CGM can be useful for people who have type 1 diabetes for the following reasons:



**CGM** gives you a reading every 5 minutes.



**CGM** will also display a **trend arrow** – which tells you how fast your glucose levels are changing either up or down.



**CGM** can give alarms about **glucose levels that are too high or too low**.



**Some CGM technology** is reliable enough to be used to make decisions about managing your BGL, without having to do a finger prick as well.



**Some CGM technology** can be used together with an insulin pump, with functions that have the ability to **suspend your background or basal insulin delivery** automatically, in response to low glucose levels.



**Some CGM technology** will send the glucose readings to the “cloud” and allows up to 5 people to follow the glucose levels on their smartphone as long as they have internet access.



### 3.8 Aims

- Ideally **CGM** should be worn at least 75 percent of the time.
- Your aim should be to be in target 80 percent of the time.
- Speak to your diabetes team if you require assistance in reaching these targets. Additional information is available at:

➤ [www.pch.health.wa.gov.au/Our-services/Endocrinology-and-Diabetes](http://www.pch.health.wa.gov.au/Our-services/Endocrinology-and-Diabetes)

➤ [www.childrensdiabetescentre.org.au](http://www.childrensdiabetescentre.org.au)

### 3.9 Things to consider



- **CGM requires** you to wear a device, which is inserted under the skin and needs to be changed regularly.
- **The receiving device should be within 6m of the user.** This may mean that a child will need to have a smartphone (if this is the receiving device) that may need to be taken with them to school.
- **Using CGM** does not currently completely eliminate the need for finger-prick checks.
- **CGM** gives a 'sensor' glucose level and measures a different fluid to blood. This may be different to blood glucose levels. The difference between CGM levels and BGL levels can be greater when your glucose levels are changing rapidly.
- If your **symptoms do not match your sensor glucose level**, confirm with a finger prick.
- **Paracetamol** can affect the accuracy in the Dexcom G5 sensor.

## 3.10 Interested in CGM?

1

### See if you are eligible for the subsidy

- In **April 2017**, the Federal Government announced **fully subsidised CGM** for eligible children and young adults under the age of 21 with **type 1 diabetes**.
- Please see the below link for more information on this subsidy and the eligibility criteria.

[www.ndss.com.au/cgm](http://www.ndss.com.au/cgm)

2

### Think about which CGM device you would like to use

- Different devices have different features and capabilities, so it is important that you **choose the device that is right for you**. The following companies have CGM devices:

#### DEXCOM

Website: [www.dexcom.com/en-AU](http://www.dexcom.com/en-AU)

#### MEDTRONIC

Website: : <https://www.medtronic-diabetes.com.au/>

- **CGM comparison tool**

<https://diabetes.telethonkids.org.au/resources-tab/>

3

### See your diabetes team for more information and to complete the eligibility form

- If you are eligible, your **diabetes team** can help you complete the form by signing and completing the **Health Professional section**.



- The use of CGM requires time, practice and new skills; your **diabetes team** will be able to provide you with **advice to ensure you get the most out of the system you choose**.
- The **helpline** is also a good resource for ordering and technical troubleshooting.

## 3.11 FLASH GLUCOSE MONITORING

**Flash glucose monitoring** is similar to CGM where a sensor is placed under the skin that can read the glucose levels in the tissue fluid. The difference is that a reading device is required to be swiped or "flashed" over the sensor in order to view glucose readings over the past 8 hours and the glucose trend arrow. Alarms for highs or lows cannot be set.

- The current flash glucose monitoring device available is the **Abbott Libre**



**It is important to note that at the time of producing this document, the Libre system is NOT subsidised by the government.**

# HYPOGLYCAEMIA

## LOW BLOOD GLUCOSE LEVELS

**Hypoglycaemia** occurs when a person's blood glucose level (BGL) falls to less than 4mmol/L. Some people refer to them as a "low" or "hypo". Because the aim is to maintain blood glucose levels between 4–8 mmol/L, mild to moderate hypos will occur from time to time.

### 4.1 MOST COMMON CAUSES

- |  |                          |
|--|--------------------------|
| 1 Too much insulin                           | 4 Increased activity     |
| 2 Not enough carbohydrate at meals or snacks | 5 Gastroenteritis        |
| 3 Delayed or missed meals or snacks          | 6 Consumption of alcohol |

### 4.2 SIGNS AND SYMPTOMS

One or more of the following signs or symptoms may occur and are generally early signs of a hypo:

- Hunger
- Shaking
- Palpitations
- Pale skin
- Sweating

**If the hypo is untreated**, there is limited glucose available for brain functioning and the following symptoms may occur:

- Dizziness
- Confusion
- Blurred or double vision, or disturbed colour vision
- Feeling tired
- Drowsiness
- Difficulty hearing
- Headache
- Poor concentration
- Slurred speech

Behavioural symptoms may include:

- Irritability
- Erratic behaviour
- Agitation
- Nightmares
- Inconsolable crying



At this stage they may not be able to follow instructions and therefore will need close supervision and treatment.

- Symptoms of hypoglycaemia can also occur when the **BGL falls rapidly.**



**Hypo treatment and a blood glucose meter must be accessible at all times.**




**If you are having repeated episodes of hypoglycemia, please contact your diabetes clinical team for assistance.**

## 4.3 If BGL <4 mmol/L

If you check your BGL and it is **less than 4 mmol/L**, it is advised to do the following:

- 1 Sit down and rest under supervision.
- 2 **Immediately give fast-acting glucose.**

**The amount will depend on age and weight.**

-  **Children ≤ 5 years old** will require approximately **5g**
-  **6-12 year old children** will require approximately **10g**
-  **Children over 12** will require approximately **15g**

Some examples of **fast-acting glucose** are (choose one):

Type of glucose	Product	Amount of glucose (g)
Glucose tablets	Glucodin	1.4g per tablet
	Trueplus	4g per tablet
Glucose drinks	Trueplus glucose drink	5g per 20ml
	Lucozade Energy	5g per 30ml
Glucose powder	Glucodin	5g per rounded tspn

NOTE: To avoid confusion between 'treats' and 'treatment', we use the above options rather than jellybeans or other sweets.

Glucose is the fastest and safest option. If you plan to treat hypos with other foods, please discuss this with your diabetes team to see if they are appropriate.

- 3 Re-check the BGL in 15 minutes. Rest until all symptoms are gone. If the level is still below 4 mmol/L, then repeat step 2.
- 4 Once your BGL is 4 mmol/L and above, follow up with approximately 15g of a slow-acting carbohydrate-containing snack to help prevent another hypo.

Some examples are (choose one):



**1 piece of fruit**  
(except strawberries  
and other berries)



**1 slice of  
wholegrain  
bread**



**1 cup  
of milk**



**1 muesli  
bar**



**NOTE: If the hypo occurs within 30 minutes before a meal, or morning or afternoon tea, your meal can take the place of the slow-acting carbohydrate.**

## 4.4 MANAGEMENT OF SEVERE HYPOGLYCAEMIA

Occasionally the child may become too drowsy to eat or drink safely or will not be able to swallow. This is known as **severe hypoglycaemia**. A severe hypo can also cause a seizure (fit) or your child becoming unconscious. If this occurs, **DO NOT put anything in their mouth** as they are at risk of choking. Place the child in the recovery position and check **DRSABC**:

**D**anger

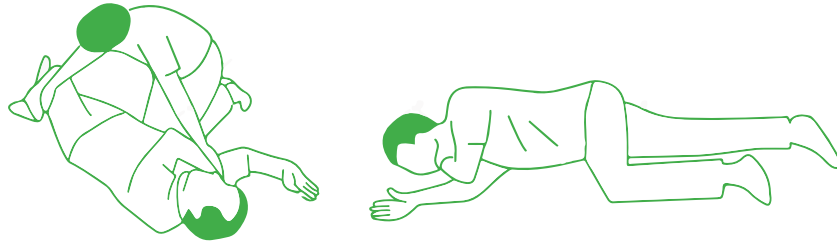
**R**esponse

**S**end for help

**A**irway

**B**reathing

**C**irculation (pulse)



Once your child is positioned safely, an **injection of glucagon (GlucaGen HypoKit)** can be given. They should respond in 10-15 minutes.

- 1 Consider phoning an ambulance if you are not confident with this process. Check blood glucose level. If the BGL is very low, the meter may read "LO".
- 2 As soon as they are able to swallow, give sweet fluids such as lucozade or sugar dissolved in water. Allow the child to sip this until the BGL is above 4 mmol/L (this may take more than 100ml) then follow with a slow-acting carbohydrate snack if the child can tolerate this.
- 3 Some people experience a headache, nausea and vomiting after a glucagon injection. Analgesia can be given for the headache. Continue with sips of sweet fluids until they are no longer vomiting.
- 4 If vomiting persists, or if BGL is not maintained above 4 mmol/L, or your child does not respond to glucagon, **call an ambulance - 000**



If your child has a severe hypo, call the diabetes team for assistance with insulin adjustment over the next few days. We suggest that you increase the frequency of BGL testing during this period, including an overnight BGL.



Please ensure that you obtain a script to replace your glucagon (either from your GP or diabetes clinic).

**Glucagen<sup>®</sup>HypoKit**

Glucagon (rys) hydrochloride  
Consumer Medicine Information

[www.novonordisk.com.au/content/dam/australia/affiliate/  
www-novonordisk-au/Patients/Documents/GluHcmi10.pdf](http://www.novonordisk.com.au/content/dam/australia/affiliate/www-novonordisk-au/Patients/Documents/GluHcmi10.pdf)



If you are interested in attending a **Basic First Aid course**, please refer to The Red Cross. **Please note** that there are specific courses for Basic First Aid in children and infants.



[www.stjohnambulance.com.au/first-aid-training/first-aid-courses](http://www.stjohnambulance.com.au/first-aid-training/first-aid-courses)

[www.redcross.org.au/first-aid.aspx](http://www.redcross.org.au/first-aid.aspx)



## 4.5 HYPOGLYCAEMIA CAN BE PREVENTED

Preventing hypoglycaemia is possible by addressing the causes.

- **Too much insulin**

Children sometimes do not eat all the carbohydrates in a meal. This can be substituted with an alternative carbohydrate option. It is recommended that a child who is old enough to do their own injections is supervised by an adult to double check the dose before injecting. This is to ensure too much insulin isn't accidentally given. During the 'honeymoon' period insulin requirements may decrease. Frequent hypos may need adjustment of insulin doses.
- **Delayed or missed meals or snacks**

If you are on a twice daily regimen, missed or delayed morning tea or lunch, may lead to hypoglycaemia. A small snack with carbohydrate at morning tea is important on a twice daily regimen.
- **Increased activity**

Adjustment to insulin dose before and after exercise may be required to prevent hypoglycaemia. Extra carbohydrate should be given before exercise. Refer to **SECTION 10** ■ EXERCISE.

BGLs should be checked before and after sport, and during the activity if it takes more than 1 hour.

Hypoglycaemia can occur up to 24 hours after sport or activity. Talk with the diabetes team about how to prevent hypoglycaemia associated with increased activity.
- **Incorrect insulin**

Occasionally the wrong dose or type of insulin is given. Do not panic, this can happen to anyone. Please call the diabetes team if you are unsure of what to do.



Frequent hypos indicate that **insulin, food and exercise are out of balance** and some adjustments will be needed. **If unsure, contact the diabetes clinic.**

## 4.6 GLUCAGON

**Glucagon** is a hormone which stimulates the liver to quickly release stored glucose into the blood. It is produced by the pancreas. A Glucagon injection is a synthetic version to produce the same result. **Glucagon will only work to increase blood glucose levels if there are stores of glycogen in the liver.**



1

Remove the orange cap from the vial and the needle guard from the syringe.

2

Inject the sterile water from the syringe into the vial of powder and mix gently.

3

Draw up 0.5mg (0.5ml) if the child is less than 25kg and 1mg (1ml) if over 25kg. Marked lines on the syringe indicate the dose.

4

Inject the glucagon into the upper outer aspect of buttock or the outer middle of the thigh.

5

It is normal to feel nauseous after getting a glucagon injection and it may cause vomiting.

- **HYPERGLYCAEMIA**
  - HIGH BLOOD GLUCOSE LEVELS
  - KETONES

# HYPERGLYCAEMIA

## HIGH BLOOD GLUCOSE LEVELS

**Hyperglycaemia** occurs when the BGL rises above 15 mmol/L.

Remember, your target glucose range to aim for is between **4 - 8 mmol/L**.

### 5.1 MOST COMMON CAUSES

- 1 Too much carbohydrate or sweet foods / fluids
- 2 Not enough insulin
- 3 Decreased activity
- 4 Stress or excitement
- 5 Illness / infection
- 6 Growth and hormones

### 5.2 SIGNS AND SYMPTOMS

One or more of the following signs or symptoms may occur and are generally early signs of a hyper:

- Increased urine output
- Increased thirst
- Increased tiredness



### 5.3 QUESTIONS TO ASK IF BGL >15 mmol/L

- Did you wash your hands?
- Are your test strips in date and have they been correctly stored?
- Is your insulin in date and has it been stored correctly? (until expiry date and in the fridge, 1 month out of the fridge)
- Have you eaten in the past 2 hours?

Occasional elevated glucose levels are expected, however if the **average BGL is persistently >8 mmol/L over an extended period of time**, this can have long-term effects as discussed in **SECTION 9** ■ LONG TERM DIABETES MANAGEMENT

**The most immediate concern if glucose levels are >15 mmol/L is the development of ketones.**

# KETONES

**Ketones** are produced as a result of the body breaking down fat to use as energy. This is because glucose (**the body's preferred source of energy**) is unable to enter the cells. Ketones are acids.

- Small levels of 0.0-0.6 mmol/L are not harmful



It is essential to check for ketones if the **BGL is over 15 mmol/L** or if you are **feeling unwell**.

## 5.4 CAUSES OF KETONES

- Insufficient insulin (such as when insulin doses are missed)
- Illness
- Periods of starvation or lack of carbohydrates

## 5.5 DIABETIC KETOACIDOSIS (DKA)

The development of large amounts of ketones is called **Diabetic Ketoacidosis (DKA)**. The build-up of acids in the blood causes a dangerous internal imbalance of electrolytes and fluids and severe dehydration. **DKA requires urgent medical attention** as a child can deteriorate and become extremely unwell very quickly. The best way to avoid DKA is to keep BGL in target range as much as possible.

## 5.6 SYMPTOMS

- Headache
- Nausea and / or vomiting
- Sweet smelling breath (similar to the smell of acetone) and/or shallow breathing
- Leg and abdominal cramps
- Flushed face
- Altered conscious state ranging from confusion to loss of consciousness



## 5.7 MANAGEMENT

- 1 If **BGL is >15 mmol/L and/or if your child is unwell**, test for ketones in either the blood or urine.
- 2 If the **ketone level is between 0.0-0.6 mmol/L (or negative on the urine strip)**, this is considered negative and does not need immediate attention. A correction dose of rapid acting insulin can be given to lower the BGL if an injection is due.  
  
If the **ketone level is  $\geq 0.6$  mmol/L (or pink – purple on the urine strip)**, additional insulin is required to help clear the ketones. Please refer to **SECTION 7 ■ SICK DAY MANAGEMENT** for advice on how much extra insulin to give or if not confident, call the diabetes educator triage line on 6456 1111 (office hours) or the on-call doctor on 6456 5993 or the PCH switchboard, 6456 2222 for assistance with doses.
- 3 Encourage frequent fluids to help clear the ketones.
- 4 Test BGL and ketones 2 hourly until they are negative.



**PLEASE NOTE:** If your child / adolescent has an **altered conscious state or is vomiting**, this requires urgent medical review – call the triage line on 6456 1111 immediately or present to Emergency Department or call an ambulance - 000.

For ketone management on an insulin pump, please refer to “**Insulin Pump Management**” resource.

## 5.8 HOW TO TEST THE BLOOD FOR KETONES\*

- 1 Ensure test strips are in date. Ketone test strips are purple in colour.
- 2 Wash and dry hands thoroughly.
- 3 Remove test strip from foil sleeve and insert into blood glucose meter (meter will turn on automatically).
- 4 Prick the tip of the finger.
- 5 Apply a drop of blood on to the purple test strip area.
- 6 Record the number in your record book when it appears on the screen and follow management as per instructions above.

(\*Only valid for blood glucose monitors that can read ketones)

## 5.9 HOW TO TEST THE URINE FOR KETONES\*

- 1 Ensure urine ketones test strips are in date.
- 2 Dip the test area of the ketone test strip into a fresh sample of urine.
- 3 Tap the strip against the container to remove excess urine.
- 4 Close the lid of the ketone test strip bottle tightly.
- 5 After 60 seconds, compare the test area with the colour chart on the bottle. (Note, timing is very important for an accurate result).
- 6 Record the result in your record book and follow management as per instructions above.

### Interpreting Urine Results

URINE STRIP COLOUR	
BEIGE	Negative
PALE PINK	Small
DARK PINK	Moderate
PURPLE	Large

Remember to check that the urine test strips are in date.

(\*The above information is for the Keto-Diabur 5000 Ketone Sticks. If you have a different brand, please refer to the product information guide inside the box)

# EMOTIONAL ADJUSTMENT TO DIABETES

## 6.1 THE ROLE OF THE DIABETES SOCIAL WORKER

**The diabetes social workers** are members of our multidisciplinary team, and are available to support children, young people and families in dealing with the impact of diabetes on their lives. The support is available while the child is a patient, from diagnosis through to when a young person transitions to adult services.

**Social workers provide** a range of support and assistance that may be needed when a child is admitted into hospital or as an outpatient.

This includes:

- Counselling
- Supporting families through times of crisis and distress
- Providing education and information
- Advocacy
- Planning for discharge from hospital
- Referral to community agencies and support services
- Delivering group work programs
- Providing information about community resources, accessing practical and material assistance

## 6.2 INITIAL DIAGNOSIS

When your child is diagnosed with type 1 diabetes it **affects the whole family**. A period of adjustment is required. During this time, your usual ways of coping with things are disturbed and you are likely to feel vulnerable and confused. There are significant feelings of loss and grief around the diagnosis and this takes time to process.

You may experience a whole range of feelings including:

- Shock
- Denial
- Anger
- Sadness or depression
- Fear
- Guilt



## 6.3 ADJUSTING TO DIABETES AS A PARENT

It is important to keep in mind that this difficult time will pass and you will regain your feeling of balance. It is helpful to recognise that you are in a vulnerable state and need to be mindful of your own needs.

Tips for helping your child include:

- Go back to normal routines
- Be patient with your child
- Help your child understand what is happening
- Allow your child to talk about their feelings and worries
- Set normal limits
- Encourage your child to spend time with friends
- Help your child to do some things on their own



A new diagnosis of diabetes may create difficult emotional issues for young people. Children look to their parents for support about how to manage their own emotions. This can be challenging for parents as they may also be struggling with their own feelings. It is important that parents and/or caregivers get support from family members, friends, support groups, GP's or other professionals, and the diabetes team.

Each child and adolescent is an individual and may experience different emotional responses at different times including:

- Difficulty coping with the emotional reaction of family members
- Feeling anxious about having diabetes
- Fear of needles and injections
- Frustration over the daily tasks of managing diabetes
- Feeling embarrassed about their diabetes
- Fearful of "being different"
- Worrying about school

## 6.4 FAMILY RELATIONSHIPS

A crisis puts stress on a family and close relationships. You may find yourself being irritable. **Remember that you are all under stress and these reactions are normal.**

Sometimes partners or other family members feel "out of step" with their reactions to the diagnosis. One parent may be tearful and want to talk about things — the other becomes practical and wants to "get on with it". **These are different ways of coping with the same situation.**



**Accepting each other's differences can help people to support each other.**

## 6.5 BROTHERS AND SISTERS

**Siblings of the child with diabetes also need to have their feelings understood.** They need to know what is going on and be given a simple explanation about diabetes. Some may fear that they too will get diabetes. Some siblings may react to the extra attention given to the child with diabetes. They also need support and reassurance.

## 6.6 RESOURCES AND COMMUNITY SUPPORT



Centrelink

### **Carer Allowance and Health Care Card** (caring for a child under 16 years)

Type 1 diabetes in children under 16 years old is a recognised condition for Carer Allowance.

If you share the caring role with someone who is not your partner, you may both be eligible for some Carer Allowance.

#### Payment rate

**Carer allowance comes with a Health Care Card (HCC).** Having a HCC will give you concessions on health care costs. This means you can get cheaper prescription medicines through the Pharmaceutical Benefits Scheme (PBS). Other concessions are also available.

*If you are receiving a Carer Allowance payment, each year, the following supplementary payments are currently also paid annually:*

- Child Disability Assistance payment
- Carer Supplement for each child in your care who qualifies for Carer Allowance

You do not have to pay tax on Carer Allowance.

#### What happens when my child turns 16?

**Centrelink reviews all payments when your child turns 16 and carer's allowance ceases at this point.** You will, however, be eligible to apply for a "Health Care Card for former recipient of Carers Allowance Health Care Card", which can be applied for online or by submitting a paper claim form.

For further information, contact Centrelink:



visiting a local office



13 27 17



[www.humanservices.gov.au](http://www.humanservices.gov.au)

**If you need assistance, please contact your diabetes team social worker on 6456 1111**



## Chronic Disease Management Plans

Children with a chronic medical condition and complex care needs such as type 1 diabetes are eligible to access a **maximum of 5 allied health services per calendar year with a Medicare Rebate**. Your GP will prepare a Chronic Disease Management Plan to facilitate referral to the relevant allied health services, which can include:

- ▶ Exercise physiologist
- ▶ Occupational therapist
- ▶ Physiotherapist
- ▶ Podiatrist
- ▶ Psychologist
- ▶ Speech Pathologist

**Please speak to your GP or your Diabetes Team for further information.**

## Mental Health Management Plan


Adjustment to a chronic condition can be challenging. A mental health management plan is available through your GP. Your doctor can arrange referral to psychological support services in your area, with Medicare rebate for up to 10 appointments.

**Please speak to your GP for further information.**

## Private Health Cover

Insulin pump therapy is provided by Private Health Insurance Companies. You will need to contact your private health insurer to check the level of cover.

Refer to the Australian Government website for information on the new tiers of hospital cover.

 <https://beta.health.gov.au/resources/publications/private-health-insurance-reforms-gold-silver-bronze-basic-product-tiers-fact-sheet>

There is generally a waiting period of 12 months.

**Please contact the Diabetes team about loan of pumps during the waiting period. Donated pumps may be available for those unable to afford Private Health Insurance. Please discuss this with your Diabetes Team.**



## Ambulance Cover

All parents are encouraged to consider urgent ambulance cover for their child with type 1 diabetes. Ambulance services can be expensive and are not covered by Medicare.

**Most major health insurance companies offer urgent ambulance cover.**



## MedicAlert Bracelet

All children diagnosed with type 1 diabetes are strongly encouraged to wear a MedicAlert bracelet. The cost of a MedicAlert bracelet starts at \$49 annually. Your diabetes nurse educator can assist in completing the form or you can access it online at:

 [www.medicalert.org.au/](http://www.medicalert.org.au/)

Pharmacies also carry Mediband bracelets. Information can be found on the Mediband website:

 [www.mediband.com/au](http://www.mediband.com/au)

## Patient Assisted Travel Scheme

The **Patient Assisted Travel Scheme (PATS)** provides permanent country residents with financial assistance when travelling more than 100km to access the nearest eligible medical specialist service (including Telehealth).

PATS provides a subsidy to eligible patients, however it does not cover all costs associated with travel and accommodation. For more information about PATS visit:



[www.wacountry.health.wa.gov.au/pats](http://www.wacountry.health.wa.gov.au/pats) or



contact your local hospital or regional PATS office



## National Diabetes Services Scheme (NDSS)

The **NDSS** is an initiative from the Australian Government which provides subsidised prices on a range of approved diabetes consumables, such as needle tips and blood glucose strips.

To be eligible to register you must:



Live in Australia



Hold a Medicare card



Have a diagnosis of type 1 diabetes

**Registration is free.** You will be provided with a registration form at diagnosis to complete which can be signed by your diabetes educator or doctor.



[www.ndss.com.au](http://www.ndss.com.au)



## Diabetes WA

**Diabetes WA** is a not-for-profit organisation which aims to provide training and support to school staff, NDSS product information, education programs and links to support groups. You can access monthly updates on research, programs, products and services. For more information, visit:



[www.diabeteswa.com.au](http://www.diabeteswa.com.au)



## Juvenile Diabetes Research Foundation (JDRF)

**JDRF** is the leading global organisation funding type 1 diabetes (T1D) research. JDRF also support the type 1 diabetes community with information, resources, personal connection, and hope for the future. JDRF provide a peer support program which offers one-on-one support from an experienced volunteer who has lived with type 1 diabetes and can share practical advice. JDRF donates 'kidsacs' to PCH. They also administer a government funded pump program. For more information, visit:



[www.jdrf.org.au](http://www.jdrf.org.au)



## Type 1 Diabetes Family Centre

The **Type 1 Diabetes Family Centre** provides peer and psychosocial support to children, young adults and adults with type 1 and their families. The service offers a range of events, including camps, speakers, workshops and community forums.

 11 Limosa Close, Stirling WA 6021

 (08) 9446 6446

 [www.type1familycentre.org.au](http://www.type1familycentre.org.au)

## Kids and Teens Diabetes Online

**For kids and teens** there are some great interactive websites on diabetes. Here are a few to start with:



 [www.as1diabetes.com.au](http://www.as1diabetes.com.au)



 <http://myd.ndss.com.au>

## SCHOOLS




Children with diabetes, from Kindergarten to Year 12, need to be safely supported with their diabetes management at school.

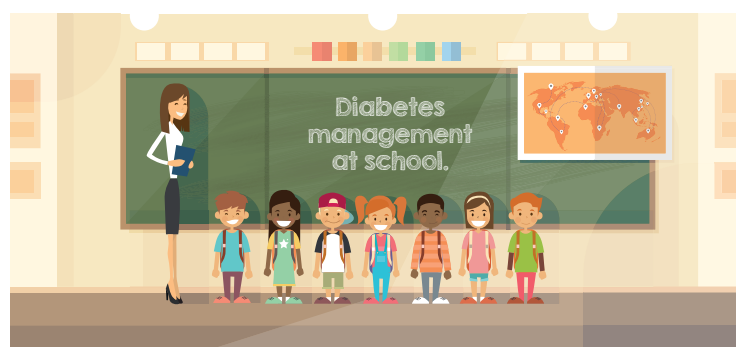


Students should be able to fully participate in school and by having better support for their diabetes at school, they will be able to reach their full potential.

Individualised Action and Management plans will be provided by your Diabetes Team to ensure that schools are equipped for your child's return to school. These plans are a day to day management plan designed as an agreement between parents, school personnel and clinical staff to ensure your child is well supported. The plan is reviewed on a regular basis.

**Liaison teachers are based at PCH. Their role is to:**

-  Assist the parent and student in the transition back to school after diagnosis.
-  Assist the parent and student with transition to kindergarten, pre-primary, a new school, high school or alternative programs.
-  Provide resources for schools.



# SICK DAY MANAGEMENT

## 7.1 GUIDELINES FOR SICK DAY MANAGEMENT

**Children and adolescents with well controlled diabetes** are not more likely to become unwell compared to children without diabetes, however when they are sick, close monitoring is required. Diabetes management can be complicated during times of illness due to reduced appetite or vomiting, potential presence of ketones and increased resistance to insulin.

We have included some guidelines for managing sick days but remember that you can call a diabetes educator (office hours) or the on-call consultant (after hours) if unsure.



### SICK DAY CHECKLIST:



**Regularly test BGL and ketones** (every 2 hours). Ketones are to be checked, even if BGL <15 mmol/L when unwell. Blood ketone testing is preferable over urine ketone tests when available and affordable. Overnight monitoring may be required.



**INSULIN MUST ALWAYS BE GIVEN** but the dose may change. Ensure the BGL is above 4 mmol/L before administering insulin.



**Review for signs of ketone development and Diabetic Ketoacidosis** (please see section 5).



**Prevent dehydration.** Drink at least 100ml (small glass) of water per hour to prevent dehydration.



**Visit your GP** if your child remains unwell to treat the underlying illness. Panadol and Nurofen can be given as directed to treat fever, but may impact on CGM accuracy.



**Eat normal meals and snacks where possible.** If your child is unable to eat or is vomiting, sip 100ml of sweet fluid or soup every hour to help maintain their BGL.

#### Examples are:



Chicken soup or clear broths



Sports / electrolyte drinks



Fruit drinks, colas, ginger ale, etc



Icy poles



Easy to digest foods such as crackers or rice may also be a good option



**If vomiting persists for more than 2 hours and ketones are increasing or still large**, please contact the diabetes clinic or consider presenting to ED.



**If your child is under 5 years old and has gastroenteritis** they may need hospital admission.



**Do not leave your child alone when unwell.**

## Sick day management for patients on injections

- Check blood glucose and ketone level.
- **DO NOT** inject dose of insulin if previous dose was given <2 hours ago. This can lead to **INSULIN STACKING** and hypoglycaemia.
- If using an Aviva meter, consider the use of 'illness' function to give extra insulin with each meal.

BGL	Blood Ketones	Plan
<4 mmol/L	<1.0	<ul style="list-style-type: none"> <li>➤ Treat hypoglycaemia</li> <li>➤ Encourage sweetened fluids or foods</li> <li>➤ Do not give insulin while BGL is below 4 mmol/L</li> <li>➤ Once BGL is above 4 mmol/L, insulin can be given but short and long acting insulin may be decreased by up to 50 percent</li> <li>➤ Consider presenting to Emergency Department (ED) in children under 5 years old, especially if oral intake is low</li> </ul>
	1.0 – 1.4	<ul style="list-style-type: none"> <li>➤ Treat hypoglycaemia</li> <li>➤ Encourage sweetened fluids or foods</li> <li>➤ Do not give insulin while BGL is below 4 mmol/L</li> <li>➤ Re-check BGL and ketones in 2 hours (may improve with additional glucose alone)</li> <li>➤ Consider presenting to ED in children under 5 years old</li> </ul>
	>1.5	<ul style="list-style-type: none"> <li>➤ Treat hypoglycaemia</li> <li>➤ Encourage sweetened fluids or foods</li> <li>➤ Re-check BGL and ketones in 2 hours (may improve with additional glucose alone)</li> <li>➤ Consider extra 5 percent of total daily insulin dose (TDD) as short acting insulin once BGL above 5 mmol/L</li> <li>➤ Consider presenting to ED in children under 5 years old</li> </ul>
4 -15 mmol/L	<1.0	<ul style="list-style-type: none"> <li>➤ No change to insulin</li> <li>➤ Check carbohydrate intake; encourage sweetened fluids if inadequate</li> </ul>
	1.0 – 1.4	<ul style="list-style-type: none"> <li>➤ Encourage carbohydrate intake/sweetened fluids</li> <li>➤ Re-check BGL and ketones in 2 hours, as ketones may fall with no extra insulin</li> <li>➤ Consider extra 5 percent of total daily dose (TDD) as short acting insulin</li> <li>➤ Consider using rapid acting insulin only during the day if on twice daily insulin injections (i.e. no Protaphane or NPH)</li> </ul>
	≥1.5	<ul style="list-style-type: none"> <li>➤ Give extra 10 percent of TDD as rapid acting insulin</li> <li>Review in 2 hours:                             <ul style="list-style-type: none"> <li>➤ - if ketones are rising or remain large, consider presenting to the ED</li> <li>- if ketones decreasing, follow this guideline for additional insulin based on ketones/glucose level</li> </ul> </li> <li>➤ If significant vomiting, consider presenting to the ED</li> </ul>

## Sick day management for patients on injections *cont.*

BGL	Blood ketones	Plan
15-22 mmol/L	<1.0	<ul style="list-style-type: none"> <li>➤ Give extra 5 percent of TDD as rapid acting insulin</li> <li>➤ Encourage unsweetened fluids/water</li> <li>➤ Review BGL and ketones in 2 hours</li> </ul>
	1.0 - 1.4	<ul style="list-style-type: none"> <li>➤ Give extra 10 percent of TDD as rapid acting insulin</li> <li>➤ Encourage unsweetened fluids/water</li> <li>➤ Review BGL and ketones in 2 hours</li> </ul>
	≥1.5	<ul style="list-style-type: none"> <li>➤ Give extra 20 percent of TDD as rapid acting insulin</li> <li>➤ Review in 2 hours:                             <ul style="list-style-type: none"> <li>- if ketones rising or remain large, consider presenting to the ED</li> <li>- if ketones decreasing, follow this guideline for additional insulin based on ketones/glucose level</li> </ul> </li> <li>➤ If significant vomiting, consider presenting to the ED</li> </ul>
>22 mmol/L	<1.0	<ul style="list-style-type: none"> <li>➤ Give extra 10 percent of TDD as rapid acting insulin</li> <li>➤ Encourage unsweetened fluids/water</li> <li>➤ Review in 2 hours</li> </ul>
	1.0 - 1.4	<ul style="list-style-type: none"> <li>➤ Give extra 20 percent of TDD as rapid acting insulin</li> <li>➤ Encourage unsweetened fluids/water</li> <li>➤ Review in 2 hours</li> </ul>
	≥1.5	<ul style="list-style-type: none"> <li>➤ Give extra 20 percent of TDD as rapid acting insulin</li> <li>➤ Review in 2 hours:                             <ul style="list-style-type: none"> <li>- if ketones rising or remain large, consider presenting to the ED</li> <li>- if ketones decreasing, follow this protocol for additional insulin based on ketones/glucose level</li> </ul> </li> <li>➤ If significant vomiting, present to the ED</li> </ul>



### **NOTE: to calculate total daily dose (TDD)**

- 1 Add all insulin doses together over a 24 hour period  
Eg. breakfast 5 units + lunch 6 units + dinner 6 units + pre-bed 15 units = 32 units
- 2 Do this for the past 5 days
- 3 Add all the results together

Eg. Day 1 = 32 units  
 Day 2 = 30 units  
 Day 3 = 35 units  
 Day 4 = 31 units  
 Day 5 = 32 units  
 TOTAL = 160

Divide by 5 to get average

- 4 Eg.  $160 / 5 = 32$  units

**Therefore the average TDD = 32 units**

- For sick day management on an insulin pump, please refer to 'Insulin Pump Management' resource.

# FOOD PLANNING

## 8.1 INFORMATION ON HEALTHY EATING:

It is easier to manage diabetes when a child or adolescent has a regular meal pattern with a break of at least two hours between meals and snacks.

**For a child or adolescent with diabetes** it is important to get a good match between the food the child or adolescent eats and the amount of insulin that is given by injection. **Knowing about food and how it affects blood glucose levels will help you to care for your child.**

**Carbohydrate** is the main part of food that affects how much insulin is needed for a meal or snack. You will need to know which foods contain carbohydrate and how much carbohydrate is in different foods. You will then use this information to either:

- Keep the carbohydrate intake roughly the same from one day to the next so that a set dose of insulin can be given, or
- Vary the amount of insulin that is given based on the carbohydrate content of the meal



**Children and adolescents with type 1 diabetes** need the same healthy food that is recommended for all children.

The **Australian Guide to Healthy Eating** recommends;

- We should include foods from each of the five food groups everyday.
- Foods that contain a lot of added sugars and unhealthy fats should be eaten only occasionally.
- We should drink water rather than juice, cordial, soft drink or other drinks with added sugar.



Following these guidelines will **help all children to grow up healthy and reduce the risk of health problems** such as **obesity and cardiovascular disease**.





Australian Government  
National Health and Medical Research Council  
Department of Health and Ageing

www.eatforhealth.gov.au

# Australian Guide to Healthy Eating

Enjoy a wide variety of nutritious foods from these five food groups every day.

Drink plenty of water.

Grain (cereal) foods, mostly wholegrain and/or high cereal fibre varieties



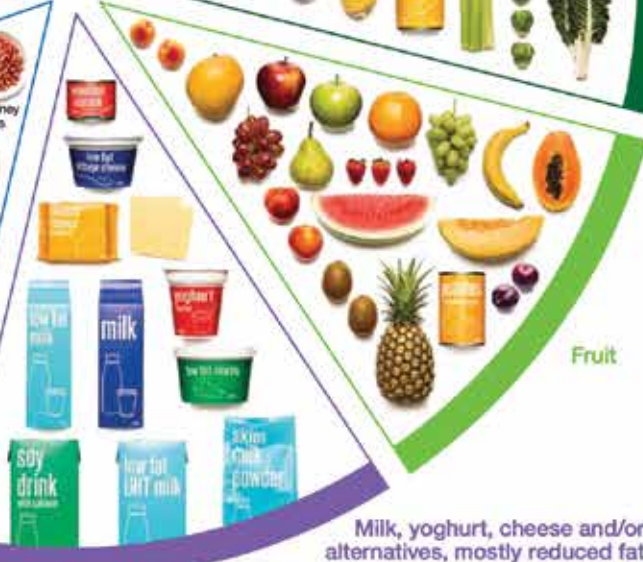
Vegetables and legumes/beans



Lean meats and poultry, fish, eggs, tofu, nuts and seeds and legumes/beans



Milk, yoghurt, cheese and/or alternatives, mostly reduced fat



Fruit



Use small amounts



Only sometimes and in small amounts



## 8.3 THE FIVE FOOD GROUPS AND HOW MUCH WE NEED EACH DAY

When planning your meals, include foods from each of the five food groups. The [Australian Guide to Healthy Eating](#) shows the recommended number of serves from each of the food groups for children of different ages.



Source: National Health and Medical Research Council  
For further information go to: [www.eatforhealth.gov.au](http://www.eatforhealth.gov.au)



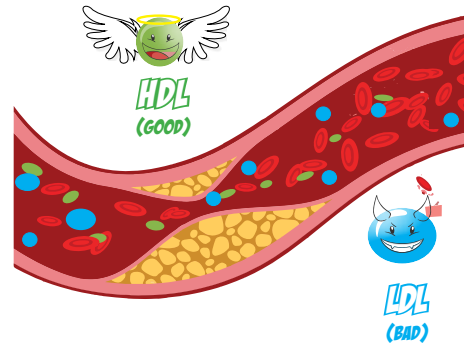
## 8.4 DIETARY FATS








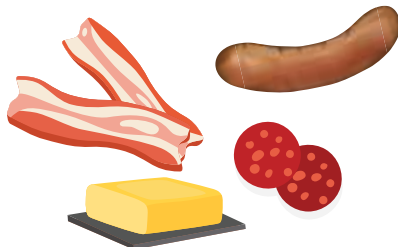
Fats and cholesterol are produced naturally by our body and the body uses them for many different things. However, if we have too much cholesterol and fat in our blood it can lead to a build-up of fats and cholesterol on the blood vessels that supply the heart, brain and other parts of the body. This increases the risk of heart disease and other cardiovascular health problems.

There are 4 different types of fat in food:



- Eating too much saturated and trans fats increases the risk of cardiovascular disease.
- Replacing these fats with monounsaturated and polyunsaturated fats will help to reduce the risk of cardiovascular disease.
- High levels of blood fats can also be caused by high blood glucose levels so it is important to manage blood glucose levels to reduce the risk of cardiovascular disease.




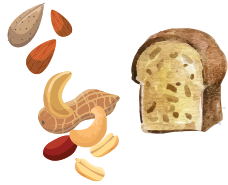

<b>Polyunsaturated fats</b> Reduce LDL cholesterol Increase HDL “healthy” cholesterol	<b>Monounsaturated fats</b> Reduce LDL cholesterol Increase HDL “healthy” cholesterol	<b>Saturated and trans fats</b> Increase “harmful” LDL cholesterol
<ul style="list-style-type: none"> <li>Oily fish such as salmon, sardines, tuna, blue-eyed travella</li> </ul>	<ul style="list-style-type: none"> <li>Olive oil</li> </ul>	<ul style="list-style-type: none"> <li>Butter, ghee</li> </ul>
<ul style="list-style-type: none"> <li>Sunflower oil and margarine</li> </ul>	<ul style="list-style-type: none"> <li>Canola oil</li> </ul>	<ul style="list-style-type: none"> <li>Lard, dripping, copha</li> </ul>
<ul style="list-style-type: none"> <li>Soybean oil</li> </ul>	<ul style="list-style-type: none"> <li>Peanut oil</li> </ul>	<ul style="list-style-type: none"> <li>Palm oil (can be found in processed foods)</li> </ul>
<ul style="list-style-type: none"> <li>Grape seed oil</li> </ul>	<ul style="list-style-type: none"> <li>Margarine such as olive oil spreads and canola spreads</li> </ul>	<ul style="list-style-type: none"> <li>Coconut oil</li> </ul>
<ul style="list-style-type: none"> <li>Walnuts</li> </ul>	<ul style="list-style-type: none"> <li>Avocado</li> </ul>	<ul style="list-style-type: none"> <li>Fat on meat</li> </ul>
<ul style="list-style-type: none"> <li>Hazelnuts</li> </ul>	<ul style="list-style-type: none"> <li>Almonds</li> </ul>	<ul style="list-style-type: none"> <li>Skin on chicken</li> </ul>
<ul style="list-style-type: none"> <li>Brazil nuts</li> </ul>	<ul style="list-style-type: none"> <li>Cashews</li> </ul>	<ul style="list-style-type: none"> <li>Processed deli meats such as salami and sausage</li> </ul>
<ul style="list-style-type: none"> <li>Omega 3 enriched eggs</li> </ul>		<ul style="list-style-type: none"> <li>Full fat cheese, yoghurt, milk</li> </ul>
<ul style="list-style-type: none"> <li>Chia seeds</li> </ul>		<ul style="list-style-type: none"> <li>Cream and ice-cream</li> </ul>
<ul style="list-style-type: none"> <li>Flaxseeds</li> </ul>		<ul style="list-style-type: none"> <li>Deep fried foods</li> </ul>
<ul style="list-style-type: none"> <li>Sunflower seeds</li> </ul>		<ul style="list-style-type: none"> <li>Pastries, doughnuts</li> </ul>
<ul style="list-style-type: none"> <li>Tahini</li> </ul>		<ul style="list-style-type: none"> <li>Cakes, biscuits</li> </ul>
		<ul style="list-style-type: none"> <li>Chocolate, chips</li> <li>Coconut cream</li> </ul> 

## Tips for reducing saturated and trans fat intake:

- Choose lean meat and cut off any visible fat before cooking.
- Avoid eating processed deli meats like polony or salami.
- Choose reduced fat milk, yoghurt and cheese or moderate full fat.
- Use poly or monounsaturated oils for cooking. Limit the use of butter, cream and coconut oil.
- Limit take-away foods that are deep fried or made with pastry such as pies and sausage rolls.
- Commercially made foods such as crisps, crackers, biscuits, pastries and snack bars often contain palm oil and trans fats. Check food labels and choose foods with less than 3g of saturated fat per 100g.
- Choose foods with healthy fats such as fish, nuts, seeds and avocado.

## 8.5 DIETARY FIBRE

**Fibre** is the part of plant foods that cannot be digested by human enzymes in the small intestine. The types, sources and benefits of fibre are summarised below.

Food sources	Food sources	Health benefits
<b>Soluble</b> 	<ul style="list-style-type: none"> <li>➤ Legumes</li> <li>➤ Oats and barley</li> <li>➤ Fruit and vegetables</li> <li>➤ Psyllium husks</li> </ul>	<ul style="list-style-type: none"> <li>➤ Lowers LDL blood cholesterol</li> <li>➤ Improves blood glucose control</li> <li>➤ Helps with healthy bowels</li> <li>➤ Softens stools to prevent constipation</li> </ul>
<b>Insoluble</b> 	<ul style="list-style-type: none"> <li>➤ Wheat bran</li> <li>➤ Wholegrain breads and cereals</li> <li>➤ Nuts and seeds</li> <li>➤ Fruit and vegetable skins</li> </ul>	<ul style="list-style-type: none"> <li>➤ Adds bulk to our stools to help it move quickly</li> <li>➤ Improves and maintains regular and healthy bowels</li> <li>➤ Linked with reduced risk of some cancers</li> </ul>
<b>Resistant starch</b> 	<ul style="list-style-type: none"> <li>➤ Cooked and cooled potatoes</li> <li>➤ Unprocessed cereals and grains (Hi-maize)</li> <li>➤ Legumes</li> <li>➤ Unripe banana</li> <li>➤ Pasta "al dente"</li> </ul>	<ul style="list-style-type: none"> <li>➤ Resists digestion in small intestine</li> <li>➤ Ferments in the gut acting as a prebiotic to produce good bacteria</li> <li>➤ Improves blood glucose control by slowing absorption</li> </ul>

## Tips for increasing fibre:

- Eat plenty of fruit and vegetables.
- Keep skins and seeds on fruit and vegetables where possible.
- Eat nuts and seeds every day.
- Choose wholegrain varieties of foods such as breads, cereals and crackers.
- Have legumes, such as lentils, split peas, dried beans and chickpeas, at least twice a week.
- Add legumes to foods such as spaghetti bolognese, shepherd's pie and soups in place of all or some of the meat.
- Use wholemeal flour in baking.
- Drink plenty of water along with a high-fibre diet to avoid constipation.

## 8.6 SUGAR

**Sugar** is a type of carbohydrate. Eating too much added sugar can contribute to obesity and teeth decay and fill you up so that you don't have an appetite for the healthy food that your body needs.

Unrefined foods such as:



are the best choice.

You should include foods that naturally contain sugar such as fresh fruit, vegetables, milk and unsweetened yoghurt as part of a healthy balanced diet.

### Tips for eating less sugar:

- All items on food labels are listed in order from most to least. The first item on the list is the main ingredient.
- The higher up the list the word sugar is, the more sugar the product contains.
- Other words found on ingredient labels that also mean sugar include sucrose, maltose, dextrose, lactose, fructose, glucose, glucose syrup, corn syrup, golden syrup, disaccharide, monosaccharide and polysaccharide.
- Avoid foods where sugar is the main ingredient such as soft drinks, lollies, cordial and jelly.
- Fruit juices are also a concentrated source of sugar and are best avoided.
- Other foods that may contain a lot of sugar are cakes, biscuits, breakfast cereals, ice cream, fruit bars, muesli bars and chocolate spreads.

## 8.7 SWEETENERS

**There is no need to buy special diet or diabetic products**, although some people use them to increase the variety of foods they have to choose from. Artificial and intense sweeteners are monitored and regulated by Food Standards Australia New Zealand (FSANZ). FSANZ report they are safe for humans based on expected intakes and the current research available.

There are two main groups of sweeteners:

### 1 Non-nutritive: sweeteners that provide a sweetening effect without adding carbohydrates or calories

Name	Label Code Number	Brand Name
➤ Acesulphame K	➤ 950	Sunett <sup>®</sup> , Hermesetas Gold <sup>®</sup>
➤ Alitame	➤ 956	Aclame <sup>®</sup>
➤ Aspartame	➤ 951	Equal <sup>®</sup> , Equal Spoonful <sup>®</sup> , Hermesetas Gold <sup>®</sup> NutraSweet <sup>®</sup>
➤ Saccharin	➤ 954	Hermesetas <sup>®</sup> , Sugarella <sup>®</sup> , Sugarine <sup>®</sup> , Sweetex <sup>®</sup>
➤ Cyclamate	➤ 952	Sucaryl <sup>®</sup>
➤ Sucralose	➤ 955	Splenda <sup>®</sup>
➤ Steviol glycosides	➤ 960	Stevia

## 2 Nutritive or Carbohydrate Modified

These sweeteners may also be labelled as carbohydrate-modified or diabetic foods. They can provide a sweet taste with less kilojoules or energy when compared to sugar but are not completely sugar free.

Some common foods that contain these sweeteners are 'sugar-free' lollies, ice-creams and desserts.

Some of these sweeteners can have a laxative effect and some can have an effect on blood glucose levels.



You should monitor their effects on your child and their blood glucose.

Name	Name
Fructose	No code
Isomalt	953
Lactitol	966
Mannitol	421
Xylitol	967
Sorbitol	420
Maltodextrin	No code
Polydextrose	1200
Thaumatococin	957

## 8.8 COOKING AND BAKING

Recipes can easily be modified to make them healthier. Below are some examples of healthy changes.



Ingredient	Healthier alternative
Sugar 	<ul style="list-style-type: none"> <li>Try <b>reducing the sugar in recipes</b> by a third to half i.e. <math>\frac{1}{4}</math> cup instead of <math>\frac{1}{2}</math> cup</li> <li>Swap some of the sugar with fresh, dried fruit or pureed fruit</li> <li>Use <b>low fat natural yoghurt</b> to sweeten recipes instead of added sugar</li> <li>Swap with a sweetener that is not affected by heat such as <b>Stevia or Splenda</b></li> <li>Increase the amount of <b>cinnamon or vanilla</b> in a recipe to increase the impression of sweetness</li> </ul>
Milk, yoghurt, cheese, cream 	<ul style="list-style-type: none"> <li>Use <b>low fat or reduced fat dairy products</b> (unless your child is under 2 years old)</li> <li>Use <b>low fat natural yoghurt</b> instead of creams or sour cream</li> <li>Try <b>low fat ricotta cheese</b> in place of cream</li> </ul>
Butters and oils 	<ul style="list-style-type: none"> <li>Reduce the amount of <b>butter</b> in the recipe</li> <li>Use <b>polyunsaturated and monounsaturated margarine and oil</b> such as <b>canola, sunflower or olive oil</b> in place of butter</li> <li>Swap butter on bread with <b>reduced fat cream cheese, hummus, or avocado</b></li> </ul>
Vegetables 	<ul style="list-style-type: none"> <li>Add <b>extra vegetables to meals</b> (e.g. <b>grated carrot and zucchini, chopped mushrooms, tomato and onion</b> to a bolognese sauce)</li> <li>Add <b>extra vegetables</b> to sandwiches, burgers, wraps, soups, salads and in pizza toppings</li> <li>Keep <b>skins on vegetables where possible</b>, such as leaving the skin on potatoes before they are mashed</li> </ul>
Baking 	<ul style="list-style-type: none"> <li>Substitute <b>wholemeal flour</b> for all to half of the flour when making <b>breads, muffins, pancakes, pikelets or other baked products</b></li> <li>Add <b>oats</b> to recipes for extra fibre</li> <li>Choose <b>reduced fat pastry</b> made with <b>poly or monounsaturated oil</b></li> </ul>
Coconut milk/cream 	<ul style="list-style-type: none"> <li>Use <b>reduced fat coconut milk</b>.</li> <li>Try <b>evaporated skim milk + coconut essence</b> (e.g. Carnation Light &amp; Creamy coconut flavoured evaporated milk)</li> </ul>





### Nutrition Information

SERVINGS PER PACKAGE: 11    SERVING SIZE: 23.2 g (4 BISCUITS)

	AVG. QUANTITY PER SERVING	% DAILY INTAKE* (PER SERVING)	AVG. QUANTITY PER 100 g
ENERGY	406 kJ	4.7%	1,750 kJ
PROTEIN	2.8 g	5.6%	12.0 g
FAT, TOTAL	2.6 g	3.7%	11.3 g
-SATURATED	0.3 g	1.4%	1.4 g
-TRANS	0.0 g		0.1 g
-POLYUNSATURATED	0.9 g		4.0 g
-MONOUNSATURATED	1.2 g		5.3 g
CHOLESTEROL	0 mg		0 mg
CARBOHYDRATE	14.1 g	4.6%	60.9 g
-SUGARS	0.4 g	0.4%	1.6 g
DIETARY FIBRE	2.6 g	8.7%	11.4 g
SODIUM	125 mg	5.4%	540 mg
NIACIN VIT(B3)	1.4 mg (14%)†		6.1 mg

\* BASED ON AN AVERAGE ADULT DIET OF 8700 KJ.  
† PERCENTAGE OF RECOMMENDED DIETARY INTAKE PER SERVE

## Sugars

Best choices have less than **10g per 100g**. Avoid foods with more than **15g per 100g** unless most of the sugar is coming from fruit or dairy.

Choose water as your main drink. Avoid drinks with more than **5g per 100mL**.

## Fibre

If the food is a bread, cereal, cracker or snack bar check that it contains fibre.

Aim for **5g per 100g** with the more fibre the better!

## Ingredients

WHOLEGRAINS (86%) (WHEAT, BARLEY, RYE, CORN), SEEDS (6%) (CANOLA, LINSEED, POPPY, SUNFLOWER KERNELS), VEGETABLE OIL, SALT, SUGAR, SOY. CONTAINS SOY AND GLUTEN CONTAINING CEREALS. MAY CONTAIN TRACES OF EGG, MILK, PEANUT, SESAME AND TREE NUT.

## Ingredients

Ingredients are listed in order from most to least by weight.

Limit foods with large amounts of high fat or high sugar ingredients.

## Fat

Choose foods with less than **10g per 100g** total fat and less than **3g per 100g** of saturated fat.

For milks and yoghurt aim for less than **2g per 100mL** total fat.

Choose cheese with less than **15g per 100g** total fat.

## Claims

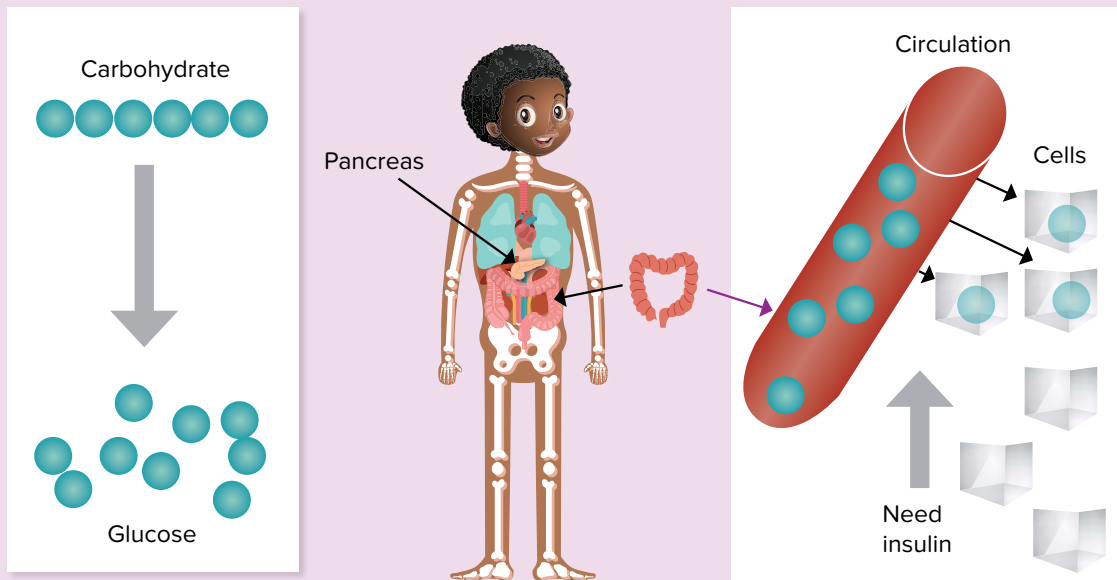
Shopping can be confusing with manufacturers using different terms to make claims about their product. Always check the nutritional panel if available. Below are some examples of claims:

- **No added sugar:** Product may still be high in other sugars.
- **Lite or light:** May be referring to the colour, flavour, salt or fat content.
- **Low fat:** Foods will have less than 3g of fat per serve but may not be a healthy choice for other reasons.



## 8.10 WHAT IS CARBOHYDRATE?

- Food is made up of different building blocks, rather like Lego™. The three main types of blocks are **carbohydrate**, **fat** and **protein**.
- Food is broken down into individual blocks by the **digestive system** and these are then carried in the blood to the body cells to be used as energy.
- The basic building block of carbohydrate is **glucose**. Carbohydrate-containing foods (sugars and starches) break down to glucose. The rate at which carbohydrate-containing foods are broken down can vary and will affect the blood glucose levels in different ways.



## 8.11 HOW DO DIFFERENT CARBOHYDRATE FOODS AFFECT BLOOD GLUCOSE LEVELS?

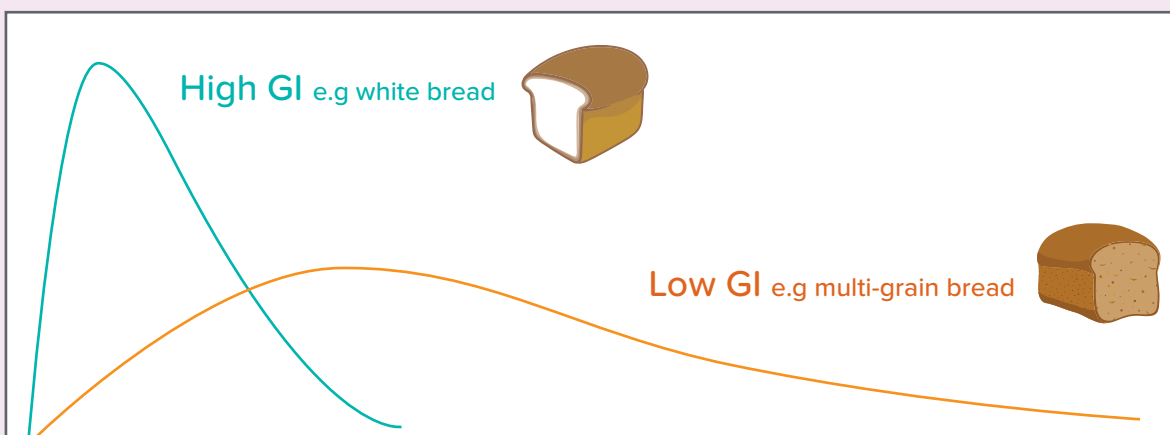
**Glycaemic Index or GI** is a measure of how different carbohydrate foods affect blood glucose levels. Foods are ranked from 0–100 based on how quickly the carbohydrate is digested and absorbed into the bloodstream.

There are a number of factors that influence how quickly carbohydrates are absorbed. Some of these factors are:

- ▶ Fibre content of the food
- ▶ Cooking and processing
- ▶ Presence of fat and protein
- ▶ Ripeness of fruit
- ▶ Type of sugar
- ▶ Type of starch
- ▶ Acidity

A meal that contains low GI foods produces a slower, more gradual blood glucose increase. Higher GI foods supply glucose more quickly and for a shorter period of time.

This picture shows the effect on blood glucose levels of a high GI food such as white bread and a low GI food such as multi-grain bread.



Including a low GI food with each meal can help to improve blood sugar levels by reducing the GI of the entire meal.

The blood glucose response to carbohydrates in foods may differ from one person to another. Learn how your blood glucose respond by testing your blood glucose level around 2-3 hours after food.

## Tips for lowering the GI of meals:

- Choose wholegrain bread instead of white bread
- Choose less processed wholegrain breakfast cereals
- Swap high GI rice such as jasmine for lower GI rices such as basmati or doongara
- Choose potato varieties that have a lower GI
- Try grains such as quinoa and pearl couscous that have a low GI
- Add legumes to salads, soups, stews, patties, curries and tacos
- Try adding lemon juice or vinegar to flavour meals
- Combine high GI foods with foods that have a lower GI to reduce the impact on blood glucose levels
- Choose low GI snacks between meals such as fruit, milk or yoghurt
- Remember that not all low GI foods are healthy - you still need to check that the food does not contain a lot of added saturated fats and sugars



## This table shows low, moderate and high GI carbohydrate foods.

The GI of more foods can be found here: [www.glycemicindex.com](http://www.glycemicindex.com)

Low GI and snack ideas can be found at: [www.gisymbol.com/recipes-meal-plans](http://www.gisymbol.com/recipes-meal-plans)

Low GI (55 or less)	Moderate GI (56-69)	High GI (70 or more)
<b>BREADS</b>		
Wholegrain, grain and seed breads	Stoneground wholemeal bread	White bread
Sourdough, wholemeal bread		
Low GI white bread		
Fruit loaf		
Chapatti made from bajra, chickpea or lentil flour		
Corn tortilla	Taco shells	
<b>BREAKFAST CEREALS</b>		
Porridge made from rolled oats		Instant oat porridge
Kellogg's Allbran, Guardian, Special K, Freedom Foods Hi-Lite Cereal, Vogel's Ultra Bran, extruded rice bran cereal	Weetbix, Vitabrits, Just Right, Mini Wheats, Allbran Wheatflakes, Healthwise for Bowel	Kellogg's Cornflakes, rice bubbles, Cheerios, bran flakes, puffed wheat
Muesli made from rolled oats, nuts and dried fruit		Rice porridge/ congee
<b>GRAINS</b>		
Spaghetti, pasta (white or wholemeal)	Gnocchi	
Rice noodles (fresh), instant wheat noodles, mung bean noodles (longkou)	Rice noodles (dried), udon noodles, soba noodles	
Doongara rice	Arborio rice, basmati rice	Jasmine rice, sushi rice, glutinous rice
Pearl barley, quinoa, pearl couscous, buckwheat	Regular couscous	Tapioca

CONTINUED TABLE:

This table shows low, moderate and high GI carbohydrate foods.

Low GI (55 or less)	Moderate GI (56-69)	High GI (70 or more)
<b>SNACKS</b>		
Hummus dip	Fruit muffin	Pikelets, pancakes, scones
Ryvita, Vita-Weat	Popcorn, shredded wheatmeal biscuit	Rice crackers, rice cakes, corn thins, puffed crispbread crackers, pretzels, water cracker
<b>STARCHY VEGETABLES AND LEGUMES</b>		
Sweet corn		
Potato - carisma, potato cooked and cooled	Sweet potato (orange flesh), potato – nicola	Instant mashed potato – most varieties, sweet potato (purple skin white flesh)
Baked beans, hummus		
Kidney beans, soy beans, black-eyed beans, butter beans, haricot/navy beans, mung beans, pinto beans		
Chickpeas-garbanzos, lentils, split peas		
<b>FRUITS</b>		
Fresh fruit – apple, orange, banana, mango, apricots, nectarines, peaches, strawberries	Pineapple, grapes, kiwi fruit, rockmelon/ cantaloupe, paw paw, cherries	Watermelon
Dried fruit – dates, apricots, peaches, pears	Sultanas, dried figs, dried cranberries	
Fruit canned in natural juice – peaches, pears, apricots		
<b>DAIRY FOOD</b>		
Milk, soy milk, almond milk	Oat milk	Rice milk
Yoghurt		
Smoothie made with milk, fruit and yoghurt		
Custard, Fruche, Le Rice		
Reduced fat ice-cream		

## Example of a Healthy Low GI Eating Plan

Breakfast	Morning Tea	Lunch	Afternoon tea	Dinner
Wholegrain bread with poached eggs, mushrooms and tomatoes	Small fruit salad	Pasta and chickpea salad	Yoghurt with berries	Roast lamb with carisma potatoes and greens
Porridge with milk and berries	Mixed berries	Tuna and corn on wholegrain crackers	Fresh fruit kebabs	Minestrone and lentil soup served with crusty wholegrain bread
Baked beans on wholegrain bread served with grilled tomatoes	Low fat custard	Wholegrain sandwich with chicken and salad	Fruit, low fat yoghurt and milk smoothie	Grilled fish with low GI white or brown rice and salad
Natural muesli topped with yoghurt and peaches	Small handful of nuts and mandarin	Hummus with veg sticks Savoury corn muffin	Glass of low fat milk Banana	Lasagne served with lean mince and green salad

### The Healthy Plate

In a healthy meal:

½ of the plate is **vegetables**



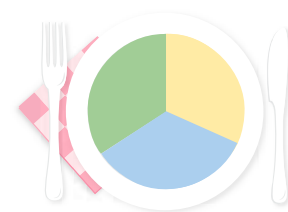
¼ of the plate is **low GI carbohydrate food**

¼ of the plate is **protein rich food**



**For children younger than 5 years** a healthy plate has:

- 1/3 **vegetables**,
- 1/3 **carbohydrate** and
- 1/3 **protein food**





## 8.12 CARBOHYDRATE COUNTING

**Carbohydrate** is the **main nutrient in our food that affects how much insulin we need**. To help keep blood glucose levels in range, it is important to get a good match between the amount of carbohydrate we eat and the amount of insulin that is given. To do this we first need to add up how much carbohydrate is in the food we are going to eat. This is called carbohydrate counting.


The **benefits of carbohydrate counting** include:

- It can help you to achieve tighter control of blood glucose levels
- It can help you to understand why your blood glucose level is high or low
- It can allow you to have more flexibility in what you eat

How you use carbohydrate counting to match your food with your insulin will depend on the insulin regimen that you are on. **You will use carbohydrate counting to either:**

 Aim for **consistency in the amount of carbohydrate in your meals and snacks** from one day to the next to match a consistent dose of insulin.

or

 **Adjust your insulin dose** based on the amount of carbohydrate in the meal that you plan to eat.

The carbohydrate foods you need to count are:

### Healthy carbohydrate foods:

- Starchy vegetables – potato, sweet potato, corn
- Wholegrain breads and crackers
- Wholegrain cereals – oats, barley, quinoa
- Pasta, noodles, rice
- Legumes – baked beans, lentils, chickpeas
- Fruit – fresh fruit, canned fruit and dried fruit
- Milk, yoghurt, custard (reduced sugar)
- Muffins and cakes made with wholemeal flour and reduced sugar

### Less healthy carbohydrate foods:

- Biscuits and cakes
- Foods with pastry such as pies, sausage rolls and croissants
- Potato crisps
- Soft drinks and juice
- Chocolates, lollies and ice-creams
- Added sugars, honey and syrups



You don't need to count foods that contain **little or no carbohydrate.**

- Non-starchy vegetables and salad
- Meat, fish, chicken, eggs, nuts (except cashews and pistachios)
- Cheese, butter, cream
- Margarine and cooking fats and oils

## 👍 8.13 READING FOOD LABELS

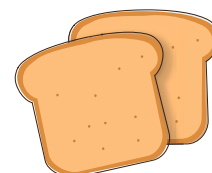
You can use the food labels on packaged foods to work out how much carbohydrate is in a food.

### 1 Carbohydrate quantities “per serve”

For many packaged foods you can work out how much carbohydrate is in the food by looking at the “**per serving**” column in the **nutrition information panel.**



Follow the steps for the example below for wholemeal bread.



• **Step 1:** Find the suggested serving size. *For this food it is two slices of bread.*

• **Step 2:** Find the per serve column

**Helga's Traditional Wholemeal 750g**

<b>NUTRITION INFORMATION#</b>		
<b>SERVINGS PER PACKAGE:</b> 9 (16 SLICES AND 2 CRUSTS)		
<b>SERVING SIZE:</b> 83.5g (2 SLICES)		
Details (approx)	Average Quantity 83.5g (2 SLICES)	Average Quantity Per 100g
ENERGY	785 kJ	940 kJ
PROTEIN	8.0 g	9.6 g
FAT, TOTAL	1.3 g	1.6 g
- saturated	Less than 1g	Less than 1g
<b>CARBOHYDRATE</b>	<b>33.4 g</b>	40.0 g
- sugars	2.0 g	2.4 g
- lactose	NIL g	NIL g
- galactose	NIL g	NIL g
DIETARY FIBRE	4.3 g	5.1 g
SODIUM	384 mg	460 mg

• **Step 3:** Find the carbohydrates row in the “per serving” column. *For this food the carbohydrates in 2 slices is 33.4g*

**Step 4:** Use this information to work out the carbs for the serving size you are going to eat if it differs from the “suggested serve”.

*i.e. 1 slice of bread: 33.4g (carbs in 2 slices) ÷ 2 = approx. 17g carbs*



## 2 Carbohydrate quantities “per 100g”

If your serving size differs from the “serving suggestion” on the pack, you can look at the **amount of carbohydrate in the 100g column** and then work out how much is in your serve of food.



Here is an example for 65g oats with 170ml milk.

NUTRITION INFORMATION		
Servings Suggestion: ½ cup or 40g Approximately 11 serves per pack		
Average Quantity	Per 40g	Per 100g
Energy	630kJ	1575kJ
	150 (Cal)	375 (Cal)
Protein	5g	12.5g
Contamination from Gluten from Wheat/Rye/Barley	<3	(nil)
Fat - total	3g	7.5g
- saturated	0.5g	12.5g
- monounsaturated	1g	2.5g
- polyunsaturated	1g	2.5g
- trans	0g	0g
Carbohydrate - Total	27g	67.5g
- sugars	1g	2.5g
Sodium	0mg	0mg
Dietary Fibre	4g	10g
- soluble fibre	2g	5g
- insoluble fibre	2g	5g



**Step 1:** Weigh your oats on a set of scales. If your serve differs from “suggested serve”, locate the carbohydrates in 100g of the food.

**Step 2:** Divide the carbs in 100g by 100 or move the decimal space two places.

*This will tell you how many grams of carbs are in 1g of the food:*  
i.e.  $67.5 \div 100 = 0.675$

**Step 3:** Work out the carb in your serve.

*This is done by taking the carbs in 1g and multiply it by the weight on the scales.*

i.e.  $0.675 \times 65g \text{ of oats} = \text{approx. } 44g \text{ of carbs}$

**Step 4:** Zero your scales and pour the milk to get its weight and repeat the process.

$0.05 \times 170ml = 8.5g \text{ carbs}$

Now calculate the total carbs for the meal and save this information for next time

$44 + 8.5 = \text{approx. } 52g \text{ of carbohydrates}$

Skim Milk Nutrition Information		
	Per Serving Size (250ml):	Per 100ml
Energy	405kJ (97Cal)	162kJ (39Cal)
Protein	9.5g	3.8g
Fat - Total	0.3g	0.1g
Fat - Saturated	0.2g	<0.1g
Fat - Polyunsaturated	<0.1g	<0.1g
Fat - monounsaturated	<0.1g	<0.1g
Fat - cholesterol	8mg	3mg
Carbohydrates - Total	13.8g	5.5g
Carbohydrates - Sugars	13.8g	5.5g
Sodium	142mg	57mg

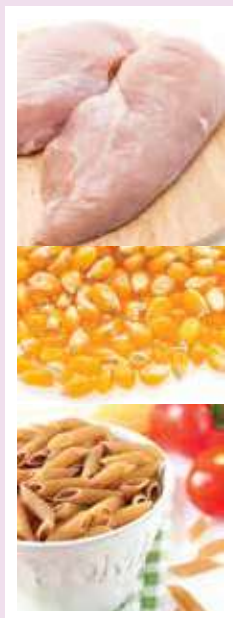


### 3 Carbohydrates in recipes

It is a good idea to **work out the carbohydrate in your homemade recipes** to make sure your values are as accurate as possible.



Different types of meals will be calculated in different ways, below is an example.



**Step 1:** Work out which ingredients are the main carb sources

**Step 2:** Calculate the carbs in each main carb ingredient using the packets or food databases

**Step 3:** Work out the carbs for the entire recipe

**Add together the carbs for each of the main carb ingredients to work out how many grams are in the entire dish.**

**300g dry pasta:**  
206g carbs  
+  
**½ cup corn:**  
7.5g carbs  
+  
**375ml evaporated milk:**  
47g carbs  
+  
**3 teaspoons cornflour:**  
13g carbs  
=  
**Approx. 275g carbs for the entire recipe**

CHICKEN AND CORN PASTA	
Recipe	
Ingredients	
350g	skinless chicken breast
300g	dry penne pasta
½ cup	cup water
1 ½ teaspoons	salt-reduced chicken stock powder
1 ½ teaspoons	of crushed garlic
1	small onion, finely diced
2 cups	broccoli florets
½ cup	frozen corn kernels
375ml	light evaporated milk
3	teaspoons cornflour
4	sun-dried tomatoes, thinly sliced (optional)
2	tablespoons grated parmesan cheese

**Step 4:** Calculate the carbs for your serve

**Using the carbs for the entire dish, calculate the carbs for the serve you plan to eat.**

**For example if eating 1/6th of the pasta**  
 $275\text{g carbs} \div 6 = 46\text{g of carbs}$







**Don't forget to save this info for next time**

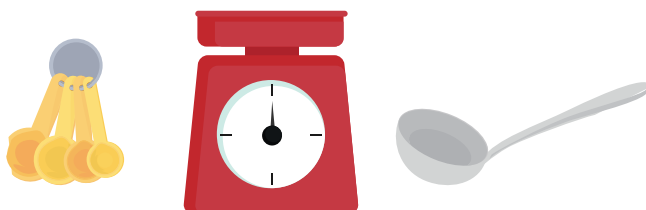
### TIP Apps, Websites and Carbohydrate-Counting Books

There are many apps, websites and carbohydrate-counting books that you can use to search for the carbohydrate content of foods. You will need to use these for foods that do not have a label. Check to make sure that the app or website contains information about Australian foods. Ask your dietitian for some recommendations.



## 8.14 HANDY HINTS FOR CARB COUNTING

-  Have **digital scales, calculator, standard measuring cups and spoons** on hand.
-  Look at the '**carbohydrate**' or '**carbohydrate total**' (not sugars) under the nutritional information column that you are using.
-  When you have **weighed your food, put it into a cup or bowl** so you can see how much they hold. This means you won't have to weigh foods each time.
-  Try to **become familiar with what foods look like on the plate**. This will help you judge how much carbohydrate is in meals or snacks when you are eating out.
-  Create a **database of the foods you usually eat**, keep a copy on the fridge or in your phone.
-  Remember young children grow quickly and so do their portion sizes. It is a good idea to **re-weigh or measure foods regularly** or so to check the serve size.



Important things to remember:

1

If having **injections twice a day**, carbohydrate counting will help to keep carbohydrate intake consistent from one day to the next.

Your child will need to **eat carbohydrate-containing food at regular intervals**, with no longer than 3 hours between meals.

2

If you are having **multiple daily injections**, then morning tea and afternoon tea are optional.

If you **do eat snacks**, aim to have less than 10g of carbohydrates.

If you are **eating more than 10g of carbohydrate for a snack**, then you may require an insulin injection with this snack, e.g after school.

**You can discuss this further with your diabetes team.**

3

**Pre-bed snack is not recommended** unless extensive exercise has been undertaken and low blood glucose levels are expected during the night.

This snack is provided in hospital as your child was likely to have increased appetite at diagnosis.

# LONG TERM DIABETES MANAGEMENT

**Follow-up visits with your treating team are an important part of diabetes management.**

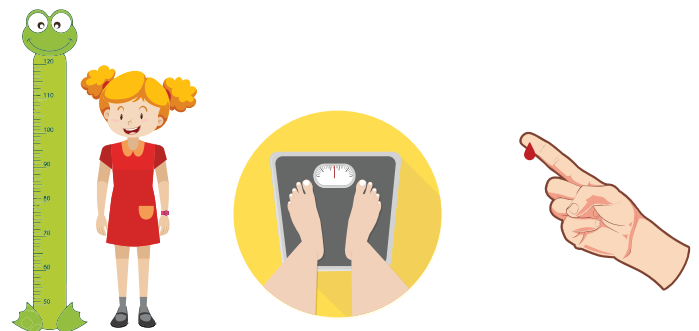
As mentioned in **SECTION 1**, your child will be scheduled to see the multidisciplinary diabetes team four times a year between the ages of 0-18 years once you complete your Newly Diagnosed Clinic appointments.

**At clinic visits the diabetes team will:**

- Address any questions or concerns you may have
- Review blood glucose levels and any other results
- Examine your child / adolescent and monitor their growth and development
- Keep you up to date with the latest in diabetes management and technology
- Organise regular screening to help reduce the risk of the development of long term complications

**On arrival at clinic, the following will occur:**

- Measure height
- Measure weight
- Do a finger prick test for a HbA1c

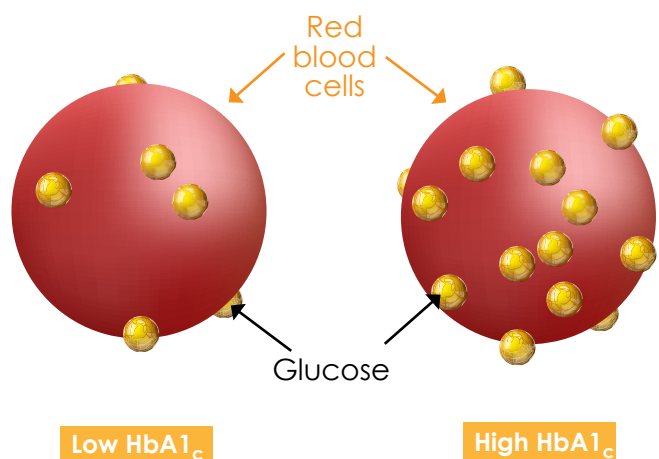


## 9.1 WHAT IS A HbA1c?

**Glycated Haemoglobin (more commonly known as a HbA1c)** is an important blood test used to indicate long term blood glucose control. It differs from a blood glucose test performed on a blood glucose meter, which displays current blood glucose levels.

Haemoglobin is located in a person's red blood cells, and is responsible for transporting oxygen around the body. Glucose molecules also attach to the haemoglobin, making it become "glycated". The more glucose circulating in the blood, the more is attached to the haemoglobin in their red blood cells.

**HbA1c** is measured as a percentage depending on how much glucose is attached to the red blood cells.





The target HbA1c for people with diabetes is  $\leq 7$  percent

The body replaces its red blood cells every three months so it is recommended that this test be done every 3 months at clinic visits.

## 9.2 WHY IS THE TARGET HbA1c $\leq 7$ percent?

The current research evidence suggests that maintaining optimal blood glucose control and having a HbA1c of 7 percent or below will **significantly decrease the risk of diabetes-related complications and improve the prospects of a healthy lifespan**, as shown through the:

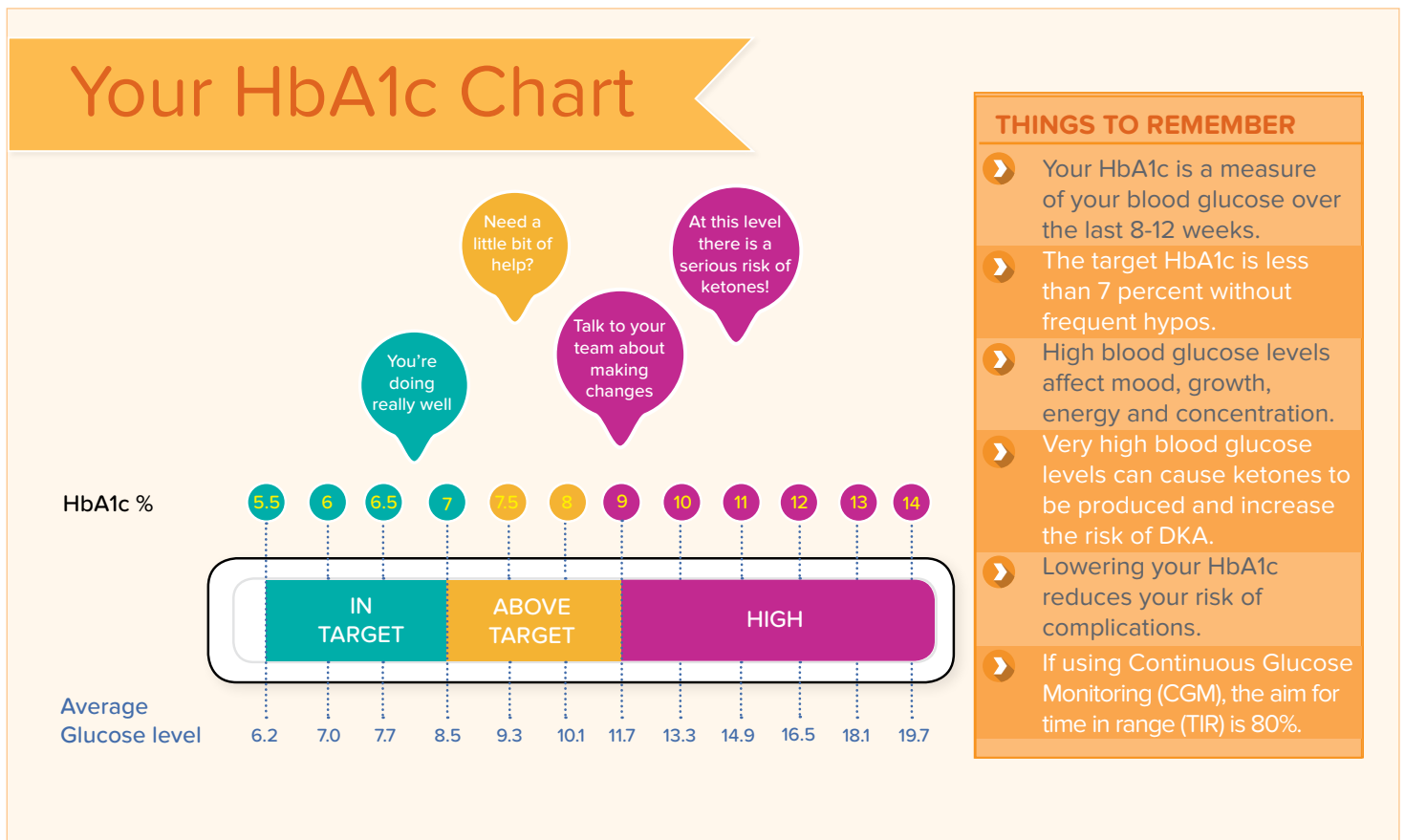


'**Diabetes Complications and Control Trial (DCCT)**' and the '**Epidemiology of Diabetes Interventions and Complications (EDIC)**' follow up.  
[www.ncbi.nlm.nih.gov/pmc/articles/PMC3867999/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3867999/)

There is also evidence to suggest that it is especially important in childhood to try to achieve this target, as the phenomena of "metabolic memory" suggests that this is also a protective factor in the development of long-term complications.

## 9.3 HOW DO I ACHIEVE A HbA1c $\leq 7$ percent?

As the HbA1c is a reflection of the glucose levels over the past 3 months, a HbA1c of  $\leq 7$  percent can be achieved by **keeping your blood glucose levels within the target range of 4-8 mmol/L**. Occasions of blood glucose levels out of this range are normal, however the aim should be to be in target as much as possible.



Through the various sections of this resource, you have read that maintaining blood glucose levels in range involves a balance between:

- The administration of insulin
- Keeping a healthy lifestyle – which includes a healthy, balanced diet and physical activity

The **Diabetes Team** are available to help educate and upskill you so that you are able to self-manage diabetes in your day-to-day life.

## 9.4 WHAT COMPLICATIONS CAN ARISE FROM HIGH GLUCOSE LEVELS OVER TIME?

**Long term exposure to elevated blood glucose levels can cause damage to the blood vessels and nerves.** These include the large vessels of the heart and brain, and smaller blood vessels such as those of the eyes and the kidneys. During clinic appointments, screening will be done to ensure the development of any complications are picked up as early as possible.

TEST	FREQUENCY	FOR WHO?
<b>Blood pressure</b>	➤ Twice per year	➤ Children 12 years old and over
<b>Lipids</b> (blood test)	<ul style="list-style-type: none"> <li>➤ Every 5 years</li> <li>➤ Every 2 years</li> </ul> <p><i>*Unless medically indicated to test more often.</i></p>	<ul style="list-style-type: none"> <li>➤ For children under 12 years old</li> <li>➤ For children over 12 years old</li> </ul>
<b>Microalbuminuria</b> (urine test)	➤ Yearly	<ul style="list-style-type: none"> <li>➤ Children under 11 who have had diabetes for more than 5 years</li> <li>➤ Children over 11 who have had diabetes for more than 2 years</li> </ul>
<b>Eye test</b>	➤ Every 2 years	<ul style="list-style-type: none"> <li>➤ From 9 years old for children who have had diabetes for more than 5 years</li> <li>➤ From 12 years old for children who have had diabetes for more than 2 years</li> </ul>

As there is evidence that children do not have complications with their feet, we do not do any formal foot testing. However, it is very important to maintain good foot care. You may wish to ask for a referral to a podiatrist (foot specialist).

Additional tests may also be performed at certain intervals such as coeliac screening and thyroid function, which are not long-term complications of diabetes.



## 9.5 GETTING THE MOST OUT OF YOUR CLINIC APPOINTMENTS

The Diabetes Service at the Perth Children's Hospital is the only specialist centre in Western Australia providing the complete multidisciplinary care required to treat and manage diabetes. The Service cares for over 1,000 children with Type 1 diabetes.

### Please come prepared for your clinic visits:

- Parking** is available at **Perth Children's Hospital basement car park** (easiest option), entrance from Hospital Avenue or in the multistorey car park, entrance from Winthrop Avenue. Please bring money for parking as the hospital does not support parking.
- Please bring your **Medicare card** and **appointment letter** to assist with the booking-in process at arrival.
- Please **read any emails** sent to you about clinic appointments. They provide valuable information about the clinic.
- Please arrive at your appointment **15 minutes early**, especially if you have a pump or CGM. Make a **list of any questions** you may have and bring this with you.
- Please arrive **early for all group sessions** as they can't be delayed if you arrive late.
- CGM training requires using certain apps and having data available **before the training starts**. If you are having difficulty with this, please call the Diabetes Nurse Educator before the training session to get assistance.
- Please **upload your pump data** if you use a pump **before your clinic visit**.
- If you are on a pump, have a plan in place in case your pump fails. Pump failure guidelines are available at the clinic and on the PCH website.
- Remember to ask for insulin and/or glucagon **scripts** or you will need to visit your GP to get one.
- Please complete any forms or information you need **before coming to the clinic** and **bring the forms with you**. Please contact the Diabetes Nurse Educators if you need specific forms and don't have them.
- Medical Assessments for Fitness to Drive** can only be completed in clinic. Please bring this to clinic if needed.
- Please tell the team if you have **travel plans in the next three months**. We can provide you with a travel letter and help you with diabetes management while you are away.
- Please bring any **school management plans** or **camp plans** if you need any assistance with these.
- Please bring any **Special Provisions forms** that need completion for school exams. These forms need to be completed in April, (except if you are newly diagnosed after April).



# EXERCISE

## EXERCISE OVERVIEW

- Diabetes should not stop children participating in any sporting activity and there are many top athletes with type 1 diabetes
- All people with type 1 diabetes should do at least 60 minutes of exercise every day
- Measure BGL before, during and after exercise
- Exercise usually lowers blood glucose levels (BGL)
- Delayed hypos can occur after strenuous exercise
- Plan ahead before exercising, which may require lowering the insulin dose, eating carbohydrates or both
- Exercise safely, drink plenty of water and use sunscreen outside

### 10.1 MY CHILD HAS JUST BEEN DIAGNOSED WITH DIABETES – IS IT OK TO EXERCISE?

**It is more than OK.** Taking part in regular exercise and physical activity is a very important part of managing diabetes and maintaining good overall health in childhood and into adulthood. It is recommended that children and adolescents do 60 minutes or more of physical activity every day. The activities can be in smaller sessions e.g. 30 minutes of football and 30 minutes of walking.



### 10.2 WHAT ARE THE BENEFITS OF EXERCISE?

**Physical activity is an extremely important element of normal healthy childhood development for all children.** In type 1 diabetes, physical activity improves cardiovascular health, strength and fitness and also reduces insulin requirements, improves glycaemic control (HbA1c) and blood lipid profiles. Exercise also has psychological and psychosocial benefits, such as improved quality of life and wellbeing. Exercise makes you feel better, more energetic and is good for your general health.

### 10.3 WHAT TYPE OF EXERCISE IS BEST?

Any exercise is good. It is better to do some exercise than no exercise at all. In babies and young children, general activity and play provide exercise. This can include running, jumping, bouncing on trampolines and climbing. Older children and adolescents should be encouraged to be involved in group or individual sports, and incorporate exercise into their daily routine. This includes activities such as organised and competitive sport, swimming, jogging and cycling. It is important to include a combination of cardiovascular and resistance activities into physical exercise.

## 10.4 DOES EXERCISE POSE ANY RISK TO PEOPLE LIVING WITH DIABETES?

Exercise does not pose risk to people with diabetes and it is very important to participate in some form of exercise every day. However it is important to be aware:

- That exercise can cause low BGL
- That lowering of blood glucose levels following exercise can occur up to 24 hours after exercise
- The best way to avoid hypoglycaemia is to regularly monitor and check glucose levels before, during and after exercise. CGM is very helpful for exercise
- You need to plan for exercise with ready access to carbohydrate, hypo kit and blood glucose meter



## 10.5 CAN MY CHILD STILL PLAY CON

**YES. Please encourage your child to continue to participate in contact and team sports or to join teams.** Insulin pumps may be disconnected for contact or watersports but it is important to remember that disconnection should not exceed two hours (as there is a risk of developing diabetic ketoacidosis when insulin is withheld). Please talk to your diabetes team about basal/bolus modifications prior to or during exercise, or wearing pump-specific clothing.

## 10.6 SUPERVISION

It is important to let supervisors (teachers, coaches) know that your child has diabetes and that carbohydrate snacks, a drink, hypo kit and the blood glucose meter are located nearby. Provide them with simple instructions if a problem should arise. A companion (relative, friend) who understands diabetes and hypo treatment should always be around for activities such as surfing, bushwalking or hiking, snorkelling or scuba diving, sailing, skiing etc. These sorts of activities require careful planning.

## 10.7 WHEN TO AVOID EXERCISE

- When you are unwell
- When BGL is low (<5 mmol/L)
- When ketones are present > 0.6mmol/L



## 10.8 HOW DOES EXERCISE AFFECT BGL?

**Generally, exercise will lower your BGL (during and after exercise). This is caused by:**

- 1 The body uses glucose as fuel. Exercise requires our muscles to contract to run, jump, push, pull, climb or throw which requires a lot of energy. Muscles get energy from stored glucose in muscle cells, or by absorbing glucose from the blood with help from insulin. Once you have finished exercise, the muscles then need to recover and get their energy back. Muscles absorb glucose out of the blood and back into their cells with reduced insulin requirements after exercise. BGL can be lowered up to 24 hours after exercise.
- 2 During exercise, our body becomes more sensitive to insulin and in the hours after exercising the insulin in your system works better at removing glucose from the bloodstream.

**In some cases, exercise can cause an increase in blood glucose.** This is caused by the release of a hormone called adrenaline resulting from excitement or stress. Generally, this occurs when someone is performing intense (anaerobic) or competitive exercise. This is usually short lived, with BGL returning to target range without requiring extra insulin.



### Aerobic and anaerobic exercise

Aerobic (or cardio) exercise stimulates your breathing and heart rate to pump oxygenated blood to your muscles. Examples of aerobic exercise include running, swimming, walking, cardio machines, dancing. Aerobic exercise increases heart rate and breathing at a sustainable level where you can exercise for 30 to 60 minutes. All exercise improves fitness and benefits your physical and emotional health.

Anaerobic exercise is usually of short duration and high intensity where you get out of breath in a few minutes, for example weightlifting, skipping, sprinting or running upstairs.

### Delayed hypoglycaemia after exercise

If you have been exercising for long periods, or very intensely, then delayed hypos may be likely. Muscles can continue to use more glucose and the body remains more sensitive to insulin. Hypos can be prevented by reducing insulin, eating extra carbohydrates and extra BGL testing. Test BGL after exercise and before bed. It may be necessary to check your BGL overnight.

### Exercise affects everyone differently.

To gain an understanding of your blood glucose response during exercise, it is important to keep a record of the types of exercise you do, and your BGL. Everyone is different in terms of fitness and ability and will have their own individual responses. Monitor your BGL carefully to look for patterns and learn how your body responds to different sports and your individual diabetes management requirements.



BGL can be measured by a glucose monitor, by finger prick or continuous glucose monitor (CGM). The use of CGM with directional arrows that indicate whether BGL is rising or falling (state of change in BGL) makes glucose monitoring easier to do during exercise, without stopping to do finger pricks. Knowing the direction of change in BGL during exercise with CGM is useful in deciding management. Caregivers are also able to view the CGM tracing and monitor where BGL falls outside of acceptable range during sport. **A hypo alarm from the CGM should be confirmed by doing a finger prick test.**

## 10.9 PLANNING FOR EXERCISE

**When you are exercising, be sure to have the following at hand:**

- Hypo treatment
- Glucose meter / testing instrument (even if you are on a CGM)
- Strips
- Fingerwipes
- Carbohydrate snack



Most exercise and activities lasting longer than 30 minutes will require insulin adjustment and/or food

## 1 Check your BGL before starting exercise and consider the guide below:

Blood glucose concentrations	Recommendations (rule of thumb) <i>*Strategies may be different for pump therapy.</i>
<5 mmol/L	<ul style="list-style-type: none"> <li>➤ Eat 10-20g of carbohydrate.</li> <li>➤ Delay exercise until blood glucose &gt;5.0 mmol/L.</li> </ul>
5 – 7 mmol/L	<ul style="list-style-type: none"> <li>➤ Consider eating 10-20g of carbohydrate.</li> <li>➤ No carbohydrates may be needed if exercising under basal insulin levels (no insulin given for food in last 2 hours).</li> <li>➤ Exercise can start.</li> </ul>
7 – 15 mmol/L	<ul style="list-style-type: none"> <li>➤ Exercise can be started.</li> </ul>
>15 mmol/L	<ul style="list-style-type: none"> <li>➤ Check blood ketones, if ketones present delay exercise and give corrective insulin.</li> </ul>

## 2 Injection sites

Insulin will be absorbed quicker from parts of the body that are involved in exercising, like the arms or legs. It is recommended to inject insulin in the tummy area or the buttocks before exercising.



## 2 Different factors affect BGL

Factor	Effect on BGL
<b>Type and intensity of exercise</b> Light to moderate intensity (Aerobic) High intensity exercise (Anaerobic)	<ul style="list-style-type: none"> <li>➤ Aerobic exercise will usually lower BGL</li> <li>➤ Anaerobic exercise may cause a rise in BGL</li> </ul>
Duration of exercise	<ul style="list-style-type: none"> <li>➤ Longer periods of exercise will lower BGL</li> </ul>
Time of day	<ul style="list-style-type: none"> <li>➤ Hypoglycaemia is less likely if exercise is performed before breakfast and before dinner (insulin levels are at basal level)</li> <li>➤ Afternoon aerobic exercise can cause an increase in overnight and next day hypoglycaemia</li> </ul>
Timing of Insulin	<ul style="list-style-type: none"> <li>➤ Exercise should be performed at least 2 hours after the insulin dose has been given for a meal, to prevent blood glucose levels going low</li> <li>➤ If exercise is performed within 2 hours after insulin is given for a meal, the insulin dose should be reduced or extra carbohydrates should be eaten</li> </ul>
Insulin level	<ul style="list-style-type: none"> <li>➤ Reducing insulin dose for a meal before or after sport may prevent hypoglycaemia</li> <li>➤ However, reducing insulin levels too much will result in hyperglycaemia and ketones</li> </ul>
Hypoglycaemia in previous 24 hours	<ul style="list-style-type: none"> <li>➤ Increase risk of hypoglycaemia</li> </ul>
Large amount of exercise in previous 24 hours	<ul style="list-style-type: none"> <li>➤ Increase risk of hypoglycaemia</li> </ul>

## 10.10 STRATEGIES FOR MAINTAINING BGL

The strategies needed to maintain your BGL depend on the duration, intensity and type of exercise.

### During exercise

- Extra carbohydrates within 30 minutes before exercising
- Reduce the bolus dose of insulin for the meal before exercise by 25 to 75 per cent for planned activity
- Or, if you are on an insulin pump, you can reduce basal insulin rate by 20 to 50 per cent from 90 minutes before exercising and until exercise is finished
- Additional carbohydrate may be necessary during exercise



### After exercise

- Eat a meal or snack that contains carbohydrate and protein within an hour of finishing exercise to reduce risk of hypoglycaemia, aid muscle recovery and replace glycogen stores (\*see food table below)
- You can adjust the meal insulin dose to prevent hypoglycaemia
  - If BGL is:** <5 mmol/L reduce dose by 50 to 75%
  - 5-8 mmol/L reduce dose by 25 to 50%
  - 8-15 mmol/L reduce dose by 10 to 25%
- If you are on an insulin pump, you can reduce the basal insulin by using a temporary basal setting that is 10 to 20% less than the usual basal rate for up to the first 12 hours after exercise
- Blood glucose levels should be checked before going to bed and during the night after exercise

## 10.11 SWIMMING

People with diabetes are encouraged to participate in swimming. Whether swimming for fun or competitively, at the beach or the pool, it's important to be prepared. We recommend you swim with a companion or with supervision/support staff who are aware of your diabetes.

Swimming, as with any exercise, will lower your BGL levels. Have ready access to your blood glucose meter, carbohydrate snacks and strips. Keep these in a Ziplock bag or other form of waterproof container. You can put this at the edge of the pool, or the end of the swimming lane if you are at the pool.

Make sure your fingers are dry before doing a finger prick as water on your skin may affect the BGL reading.





Some insulin pumps are waterproof and can be immersed in water. However, we recommend that you do not use your pump while swimming. If you do wear a pump while swimming, please check that your cannula has not dislodged as moisture can reduce the adhesiveness of the cannula against your skin. Extra taping with a waterproof bandage over the cannula or ensuring bathers are fitted firmly against the skin, may prevent dislodging. Remember to resume your pump if it is on suspend after swimming or any other exercise. Temporary basal reduction may be required.

CGMs are designed to stay in place during activities. You can add another layer of tape to the CGM. While swimming the CGM will not be transmitting data to your receiver. Remember to stop and keep track of your BGL.

### There are a few key points to remember:

Discuss your bolus and basal insulin rates with your diabetes team

- Check BGL before and after exercise
- Eat a carbohydrate snack before exercising if required
- Be prepared. Have ready access to your blood glucose meter, quick and long-lasting carbohydrate snacks and strips
- Stay hydrated (water is the best drink) before, during and after exercise
- Children should be supervised
- Exercise with someone who knows you have diabetes and can assist if necessary
- During periods of prolonged activity, e.g. hiking or a sports carnival day, BGL should be measured frequently
- Check BGL after exercising as there is a possibility of delayed hypos
- Learn from your patterns and responses to different activities
- Most importantly, exercise every day!





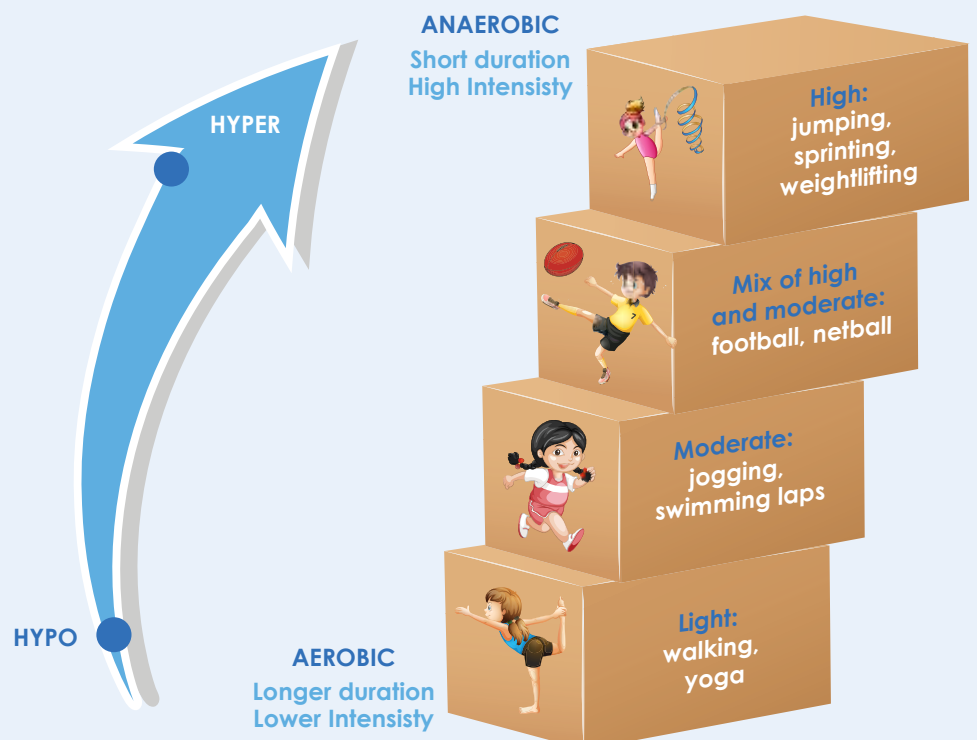
## Foods that contain 10 -20g carbohydrate

- 1 medium size piece of fruit (e.g apple, banana, pear etc)
- 250ml low fat milk (fresh or UHT)
- 100g plain yoghurt
- 8 wholegrain rice crackers
- 4 vita-weat crackers
- 2 wholegrain ryvita crackers
- 1 slice wholemeal/wholegrain bread
- 1 snack pack popcorn
- 1 snack pack roasted Fav-va beans / chick peas
- Sultana mini pack (15g serve)
- 5 dried apricots

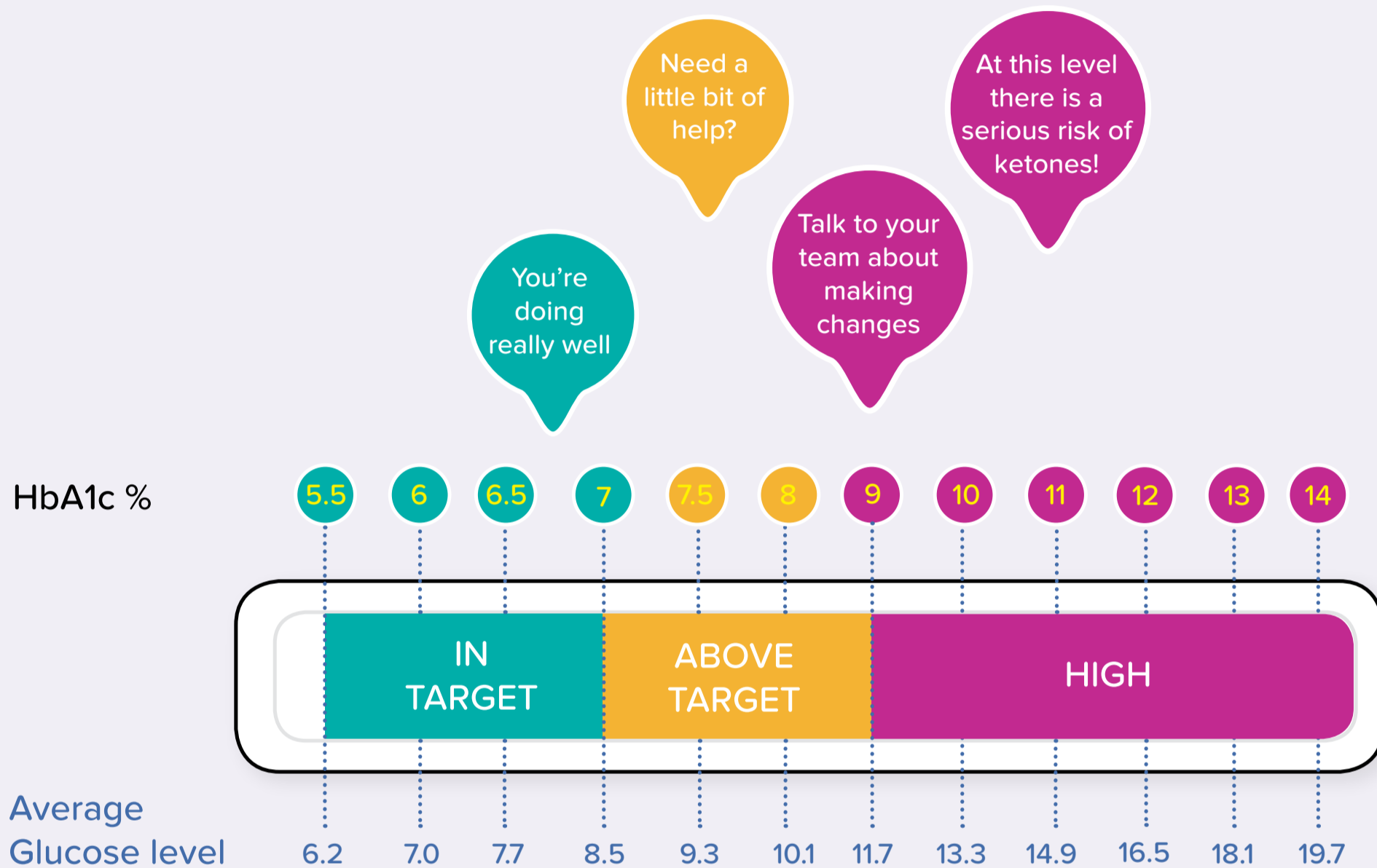
## Meals and snacks with low GI carbohydrate and some protein

- Porridge with milk and fruit
- A bowl of muesli with milk
- Baked beans on wholegrain toast
- Boiled eggs with wholegrain toast
- Nuts and dried apricots
- An apple and a slice of cheese/glass of milk
- Fruit smoothie
- Fruit salad and reduced fat yoghurt
- Wholegrain bread sandwich with protein filling such as chicken, egg, tuna, ham or peanut paste
- Homemade chicken and corn soup
- Soup with meat, chicken lentils or split peas and noodles, pasta, or barley
- Spaghetti bolognaise made from low fat mince served with salad
- Pasta with tuna
- Tuna and 4 bean mix
- Stuffed baked potato
- Stir-fry chicken and vegetables with rice
- Beef and bean burritos with salad

Example of different intensity exercise and glucose changes:



# Your HbA1c Chart



## THINGS TO REMEMBER

- Your HbA1c is a measure of your blood glucose over the last 8-12 weeks.
- The target HbA1c is 7% or lower without frequent hypos.
- High blood glucose levels affect mood, growth, energy and concentration.
- Very high blood glucose levels and cause ketones to be produced which increases the risk of a serious condition called diabetic ketoacidosis, known as DKA.
- Lowering your HbA1c reduces your risk of complications.
- If using Continuous Glucose Monitoring (CGM), aim to be in target 80% of the time.

# Know the numbers

Every child and young person with Type 1 Diabetes has to manage their condition to live a healthy, happy life. This quick guide shows the numbers that you and your family should be aiming for.

## BLOOD GLUCOSE GUIDANCE FOR TYPE 1 DIABETES

**HbA1c**  
(Shows control over 3 months)

**≤ 7%**

**7 DAY AVERAGE**  
(of daily Glucose reading)

**< 8**  
mmol/L

**% TIME IN TARGET**  
for CGM

**80%**

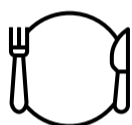
## WHAT TO AIM FOR DURING THE DAY

**BEFORE MEALS**  
(Including breakfast)



**4-8**  
mmol/L

**3 hrs AFTER MEALS**



**4-8**  
mmol/L

**BEDTIME**  
(3 hrs after eating)



**4-8**  
mmol/L

## TOP 3 TIPS FOR MANAGING BLOOD GLUCOSE

**1 GIVE INSULIN**

**15**

MINUTES BEFORE MEALS

**2 CHECK YOUR  
GLUCOSE LEVEL**

AT LEAST

**5**

TIMES A DAY

**3 REVIEW YOUR RATIOS**

ICR

ISF

CHECK YOUR MEAL RISE

Remember, many things can affect your glucose readings such as exercise, illness and worry. Do you or your family need a little help? Is there something you're struggling with? **Talk to your Diabetes Team who will be happy to help you.**

