

# Introduction to Diabetes

**A diagnosis of type 1 diabetes has been made in you/your child because of your/their symptoms and a raised blood glucose value.**

It is important to realise that no-one is to blame when a child develops type 1 diabetes, and although it is a permanent condition it is one that can be treated with daily insulin injections - currently a minimum of 5 - 6 injections a day.

## What is type 1 diabetes?

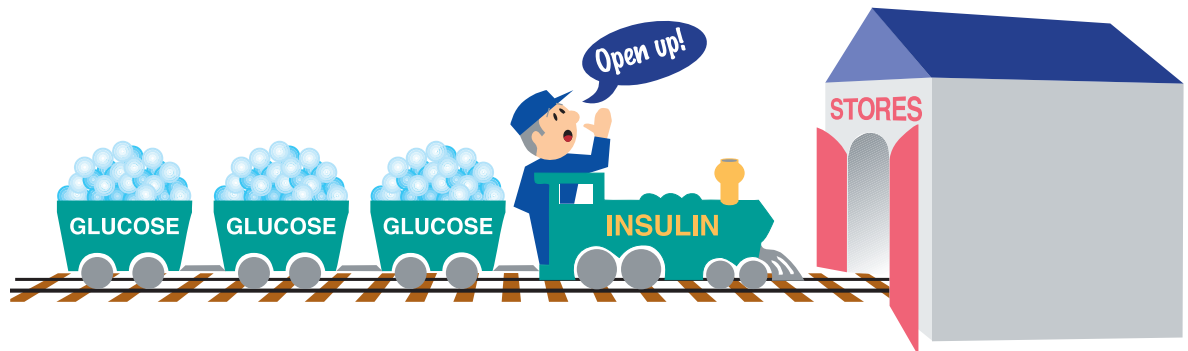
- It is a permanent condition caused by the lack of the hormone insulin in the body.
- Everyone requires insulin to live and needs a supply of insulin 24 hours/day. Insulin is made in the pancreas.
- Insulin is vital in the process of storing the energy we get from food in the form of glucose. Our bodies need energy throughout the day and night.



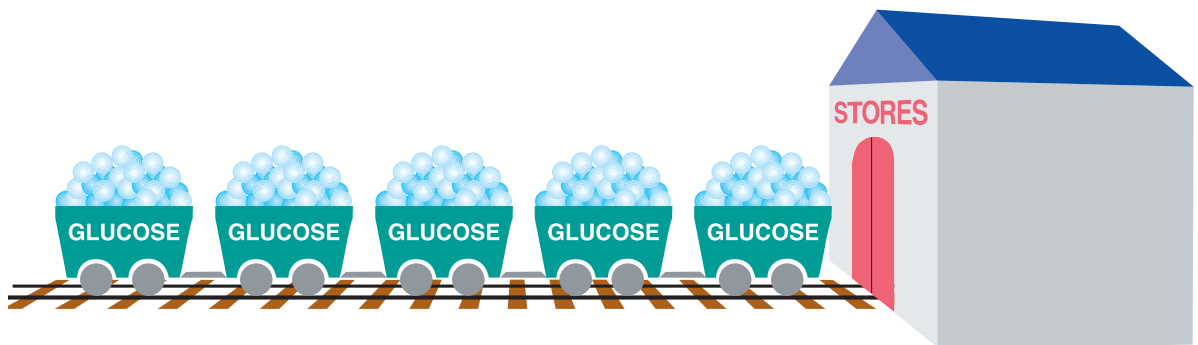
**As your body is not making insulin we will teach you how to give yourself insulin.**



**It is essential that one, or both, parents or carers are available for diabetes education sessions and during injection times to learn about the insulin injections.**



**Insulin acts like a train moving the glucose into the energy stores. Insulin tells the energy stores to open up and let the glucose in.**



**Without insulin, your body stores will be short of energy and you will have too much glucose in your blood, making you feel very tired.**



**Individuals without type 1 diabetes** produce insulin 24 hours a day as background insulin. In addition every time a person eats food containing carbohydrate (carbs) the normal pancreas automatically releases a peak of insulin to exactly match the carbohydrate, and therefore keeps the blood glucose level within the normal healthy range.

Insulin is a vital hormone in the body and keeps the glucose level of the blood constant during the day and night. Other hormones produced in the pancreas work closely with the insulin to keep the blood glucose levels stable.

**In a child/young person with untreated type 1 diabetes** the pancreas is no longer producing the insulin required to move the glucose energy from the blood stream into the energy stores. Too much glucose then builds up in the blood stream as it is unable to move to the stores.

The energy stores are empty and leave you/your child feeling tired.

### **The symptoms explained:**

- **Passing a lot of urine and drinking excessively.** The extra glucose in the blood is cleared by the kidneys and goes into the urine. This glucose in the urine acts like a sponge and draws water from the body. This explains why you/your child has been passing a lot of urine (and maybe bed-wetting in a previously trained child) and drinking large volumes of fluid to make up for that lost in the urine.
- **Weight loss.** Most children with diabetes will have lost weight by the time the diagnosis is made. The energy stores are empty and the body switches over to 'burning' fat for energy, thereby losing weight.
- **Lethargy and mood changes.** This excessive tiredness is related to the 'empty' energy stores and high blood glucose levels. This can also cause irritable behaviour and difficulty in concentrating.
- **Abdominal pain and vomiting.** Please see the section on ketones and diabetic ketoacidosis (DKA) at diagnosis (page 10), and the Sick Day Management section.

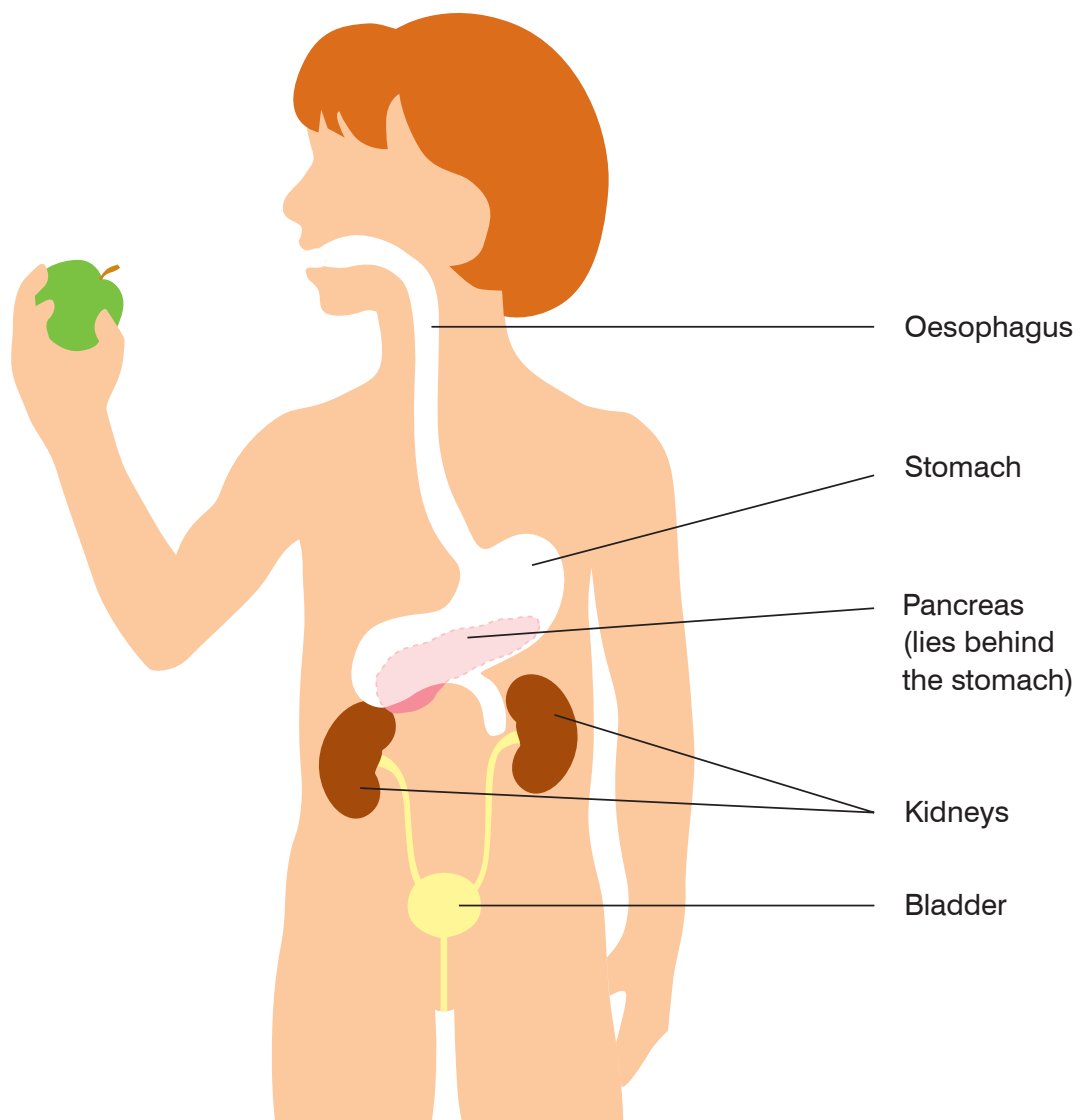


## What Causes Diabetes?

No one really knows what causes diabetes. We know that some people are more at risk of developing diabetes than others because of the 'genes' that they are born with. However there is some 'trigger' quite early in life (possibly a viral infection) which then causes damage to the pancreas, probably over many months, leading to a lack of insulin production.

The insulin-producing cells of the pancreas are destroyed by a process in the body known as 'auto-immunity': this is a process in which the body makes antibodies which attack its own cells, instead of attacking foreign cells like viruses and bacteria.

This autoimmune process in the pancreas leads eventually to a total loss of insulin production. This process cannot be reversed, but is an area of great research interest at present.



## Immediate Goals on the Ward at Diagnosis of Type 1 Diabetes

See page 10 of this section if your child is in diabetic ketoacidosis and has been admitted to HDU (High Dependency Unit).



It is vital that parents and/or carers are available throughout the day for education. The ability to provide basic diabetes care (see list below) is essential before discharge.

- 1. Replace the insulin which your/your child's pancreas is no longer able to produce:** replace background (basal) insulin, and replace mealtime (bolus) insulin by matching the dose with the carbohydrate eaten.
- 2. Clear ketones from the blood and lower the blood glucose levels towards normal values (4-9 mmol/L).**
- 3. Understand the use of the blood glucose and blood ketone monitor and learn to do finger prick testing.**
- 4. Practice the insulin injection technique using insulin pen devices.**
- 5. Learn about the tools for counting carbohydrate in food and drinks.**
- 6. Management of a low blood glucose value - 'hypoglycaemia'.**

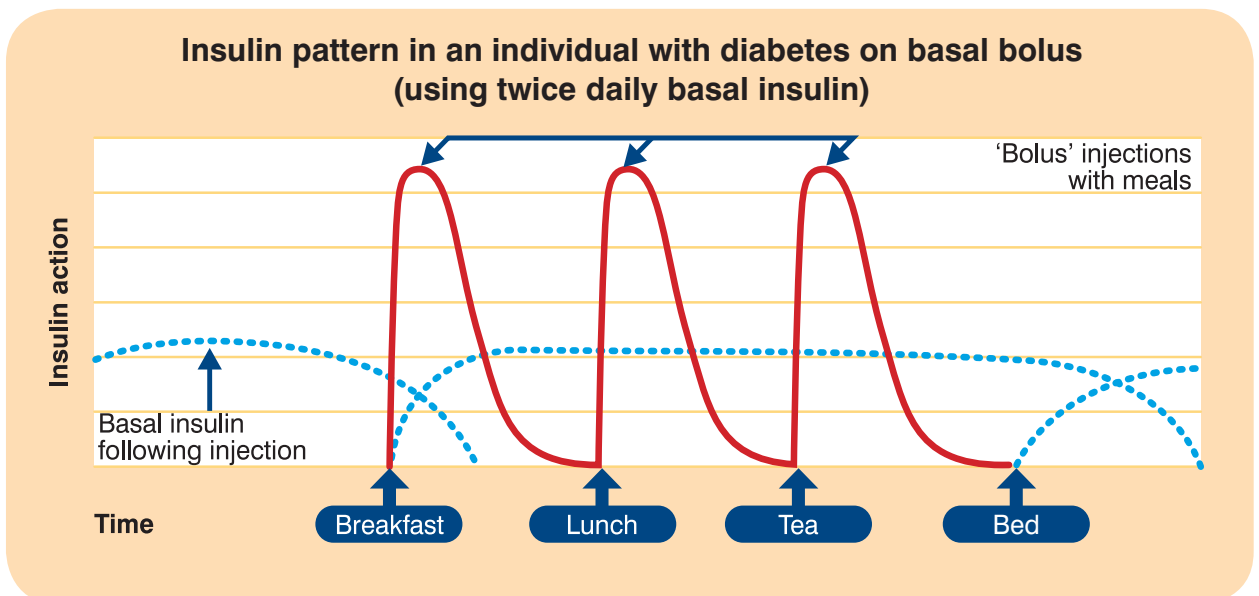
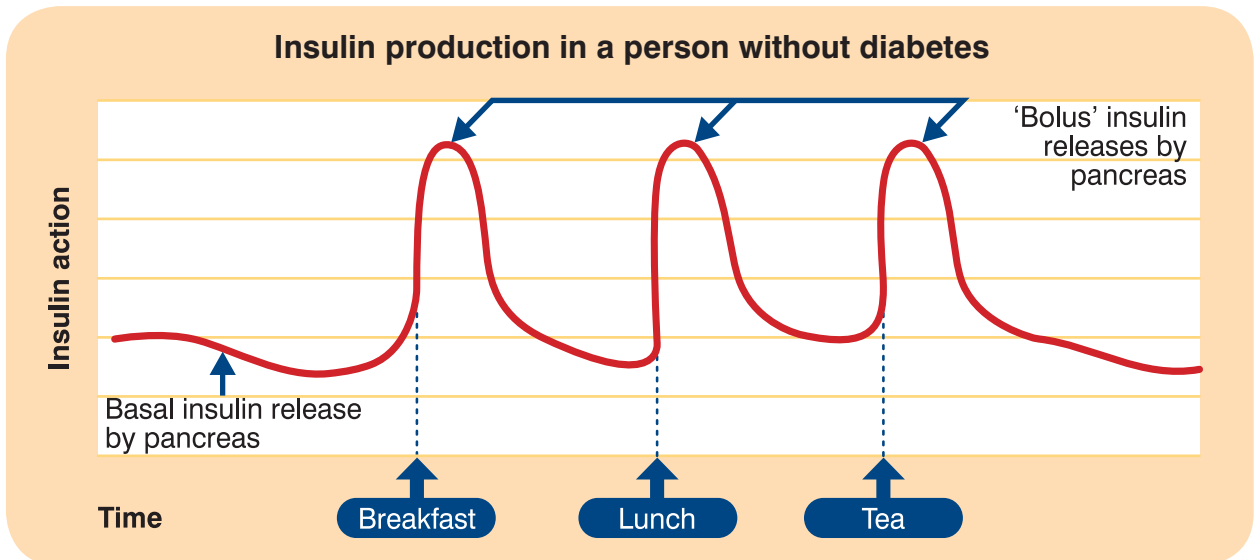


# 1. Replace the insulin which you/your child is no longer able to produce

The best way to mimic how your/your child's body previously produced insulin is to use a 'basal bolus' insulin regimen.

**This will require a minimum of 5 insulin injections per day.**

Giving or taking an injection will become part of your daily routine. Insulin is injected into the fatty (subcutaneous) tissue under the skin (not into the vein) and must be given in several different sites. **Please see goal 4 on insulin injection technique and areas to inject insulin.**



## Action of insulin using basal bolus regimen

A basal bolus regimen most closely mimics the body's own insulin production.

An initial mealtime routine is beneficial but with time a more flexible approach can be adopted. Basically this method determines the amount of very fast acting 'bolus' insulin to match the amount of carbohydrate an individual chooses to eat.

<b>Insulins used at diagnosis:</b>	<b>LEVEMIR (basal insulin)</b> - TWICE daily background insulin <b>Plus</b> <b>HUMALOG/NOVORAPID (bolus insulin)</b> - to cover carbohydrate (carbs) intake
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## 2. Clear ketones from the blood and lower the blood glucose levels towards normal values (4-9 mmol/L)

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### What are ketones?

Ketones are produced when fat is broken down in the body for any reason.

At diagnosis of type 1 diabetes, you/your child have/has a high level of glucose energy in the blood but the body has not been able to use this glucose energy because of the lack of insulin. Instead the body breaks down fat. This results in ketone production which, if **allowed** to build up in the body, can make you/your child very unwell.

### How do we clear the body of ketones?

Insulin is required to switch off ketone production and the ketones are cleared from the blood stream by the insulin injections at diagnosis. Regular insulin injections will prevent ketone production (see Sick Day Management section if unwell).

### How do we lower the blood glucose levels to normal values?

The aim is to achieve a balance between carbohydrate intake, insulin dose and activity levels.

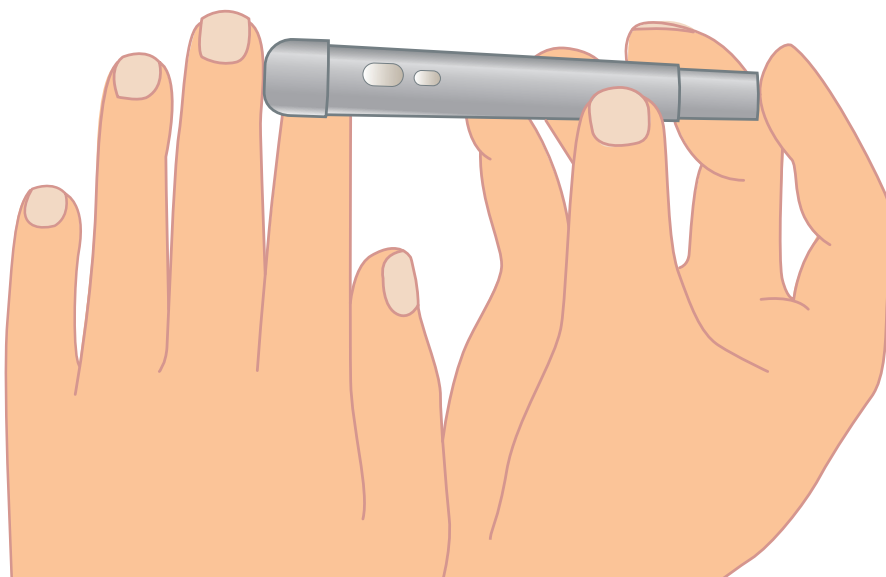
We look at patterns and trends in blood glucose readings and adapt the insulin doses accordingly to achieve the target blood glucose readings of 4-9 mmol/L.

It may take a few days or in some situations a little longer to achieve these target values.

There is no immediate danger on the ward of a high blood glucose value. However you/your child will feel better and no longer have the symptoms of a high blood glucose value once the readings are in target.

## 3. Understand the use of the blood glucose and blood ketone monitor and learn to do finger-prick testing

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Always remember to read **ALL** the instruction booklets and **KEEP** for reference and register your equipment for warranties.



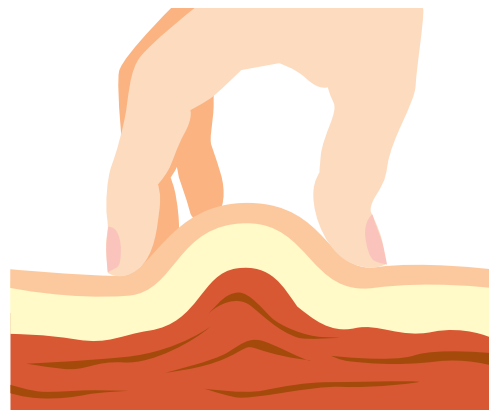
## 4. Practice the insulin injection technique using insulin pen devices

Correct injection technique is a vital part of diabetes management.

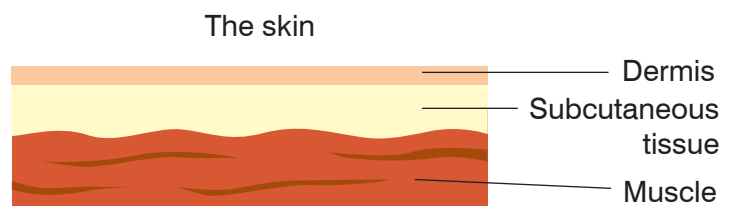
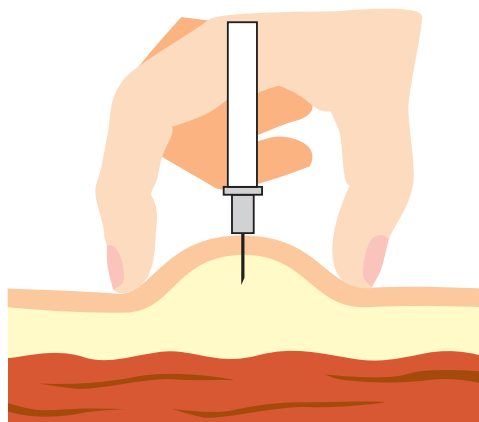
1. The technique for installing a cartridge is shown on a diagram in the box that the insulin pen comes in.
2. A new needle should be used each time in order to reduce pain and ensure accuracy of dose.
3. 'Prime' the pen by dialling up 2 units of insulin and observe a flow at the tip of the needle. You may need to do this more than once, particularly after inserting a new cartridge.
4. Dial up the appropriate insulin dose.
5. If necessary, lift up the skin fold (this is important in very slim children). **Never** inject through clothing.
6. Insert the needle at a 90 degree angle.
7. Gently press the plunger in.
8. Count to 10 before withdrawing the needle in order to ensure all the insulin has been given.
9. Withdraw the needle.
10. Release the skin fold if used. Do not rub the area.
11. Do not attempt to resheath the needle with the coloured plastic cover.
12. Dispose of the needle safely (Safeclip or sharps box).



Correct lift up



Incorrect lift up



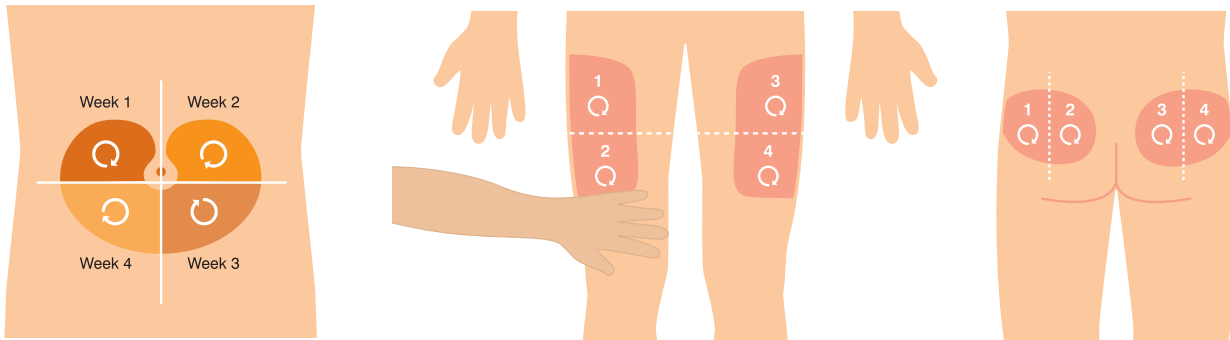
A correct skin fold lift should be done only with the thumb and index/middle finger, so that the muscle is not drawn up into the fold. Insulin will be absorbed faster when injecting into muscle and this is not helpful.



## Injection sites

**Rotating the insulin injection sites is as important as the technique used.**

- If injection sites are not rotated adequately areas will become 'lumpy' and insulin will not be properly absorbed.
- Injection sites will be checked at clinic visits and you will be supported in learning how to check the sites.
- It is important not only to rotate the sites but to use a number of areas within a site.



## Insulin storage and suspension

- Store injectable medication in current use at room temperature (for a maximum of one month after initial use, and within expiry date). Avoid direct sunlight and areas of temperature extremes. Store unopened injectable medication in an area of the refrigerator where freezing is unlikely to occur.

## 5. Learn about the tools for counting carbohydrate in food and drinks

Eating a healthy well balanced diet is important for everyone. This is especially important if you have diabetes. The dietitian will assess your dietary intake, including the carbohydrate amount you normally eat, so that the insulin doses can be correctly matched with the carbohydrate.



## 6. Management of a low blood glucose value

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**HYPOGLYCAEMIA** or a 'HYPO' = a blood glucose value of less than 4 mmol/L

This is a term used for too low a level of glucose in the blood.

### What can cause hypoglycaemia?

- Not enough food
- Too much insulin
- Extra exercise or more activity than usual

### How might I feel when having a 'hypo'?

You/your child may have no symptoms, or may look/feel different e.g.:

- Hungry
- Sweaty
- Pale
- Grumpy
- Wobbly/shaky
- Tearful/weepy
- Headache or tummy ache
- Feeling 'not right'



**Always check the blood glucose reading if you/your child have/has any of these signs/symptoms!**



Please refer to Hypoglycaemia section for 'Treating a Hypo'.

# Diabetic Ketoacidosis at Presentation of Type 1 Diabetes

When first diagnosed you/your child may be admitted to a medical ward directly, or if more unwell, to the high dependency unit (HDU). If you/your child have been admitted to the HDU, this is to treat the condition of **Diabetic Ketoacidosis (DKA)**.

## What is DKA and what are the symptoms?

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- DKA is a serious and potentially life threatening condition.
- At diagnosis of type 1 diabetes, you/your child have/has a high level of glucose in the blood but the body has not been able to use this glucose for energy because of the lack of insulin. Instead the body breaks down fat and makes ketones (acid chemicals). If these are allowed to build up in the body they can make you/your child very unwell and cause DKA.
- There is a great loss of fluids and salts from the body and ketoacidosis requires urgent treatment.
- The build up of acids in the blood stream affects the breathing pattern making it faster as the body tries to get rid of the acid.
- General abdominal/tummy pain and tenderness may also be caused by the ketoacidosis.

## What is the urgent treatment?

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- Replacement of fluids and salts at a carefully calculated rate and administered via a 'drip' (infusion) directly into a vein.
- Insulin administered via an infusion directly into the vein. This will allow the body to use glucose appropriately and importantly will 'switch off' the production of ketones which will clear from the body.
- Drinks and food are not allowed until the ketones clear from the blood. This is because the high blood ketones and the high blood glucose levels stop the stomach and gut from 'moving'/contracting as usual. Therefore any fluids or food entering the stomach will pool in the stomach and make the person vomit: vomiting can worsen the DKA and it can take longer to recover. Vomiting at presentation is a sign of DKA. A very fine tube called a nasogastric tube may be passed from the nose into the stomach to help empty the stomach and prevent any vomiting.

## What to expect in HDU

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- Very close attention from the nursing and medical staff.
- Hourly finger prick blood testing to monitor the blood glucose levels and the blood ketone levels.
- 2 - 4 hourly blood samples from a vein to measure the ketone acids in the blood and the salts and fluids in the blood.
- Monitors will be attached to you/your child to check heart rate, blood pressure and the amount of oxygen circulating in the blood.
- Fluids and insulin will be administered into a vein until the ketones clear. Thereafter you/your child will begin to learn about giving insulin injections into the fatty tissue just below the skin.

You/your child will move from HDU to the medical ward when the ketones have cleared from the blood.