Introduction to Diabetes

A diagnosis of Type 1 diabetes is made when a child develops symptoms of diabetes. These symptoms occur because the blood glucose concentration in the bloodstream is higher than normal.

There is no-one to blame when a child develops type 1 diabetes. It is a condition that can develop in anyone. Although it is a permanent condition it can be very effectively treated with daily insulin injections.

What is type 1 diabetes?

- Diabetes is a permanent condition caused when the body can no longer make enough of the hormone called insulin.
- Everyone needs insulin to live and to be able to use glucose, our energy source in the body. We need insulin constantly 24 hours a day.
- Insulin is made in the pancreas.
- Insulin is important 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.

Individuals without type 1 diabetes produce insulin 24 hours a day. In addition every time a person eats food containing carbohydrate (CHO) the 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 who has developed type 1 diabetes the pancreas is no longer able to make enough insulin needed to allow the body to use glucose as energy nor to store the glucose in the body's energy stores. Too much glucose then builds up in the blood stream.

The energy stores become empty and you/your child can feel tired.

What are the symptoms of diabetes and why does someone who develops diabetes get them?

- **Going to the toilet very frequently, Passing a lot of urine and drinking excessively.**

The extra glucose in the bloodstream is cleared by the kidneys and passes into the urine. This glucose in the urine acts a bit like a sponge and draws water from the body.

As a result of this you/your child pass a lot of urine. Sometimes children can bet wet because of the large amounts of urine that they can produce. This can happen even if a child is toilet-trained. Because a lot of urine is passed, you/your child can become very thirsty and drink large volumes of fluid to make up for that lost in the urine.

Written by: John Schulga Consultant Paediatrician NHS Forth Valley
Adapted from NHS Lothian Handbook
Date written: 31/03/2016
Date for review: 01/09/2017

- **Losing weight.**

Most children with diabetes will have lost weight by the time the diagnosis is made. As a result of the body not being able to use its usual energy stores, the body switches over to 'burning' fat for energy, resulting in weight loss.

- **Lethargy and mood changes.**

The feeling of excessive tiredness is related to the 'empty' energy stores and high blood glucose levels. This can make children more irritable and have difficulty in concentrating.

- **Abdominal pain and vomiting.**

Please see the section on ketones and diabetic ketoacidosis (DKA) at diagnosis, and the Sick Day Management section.

What causes Type 1 Diabetes?

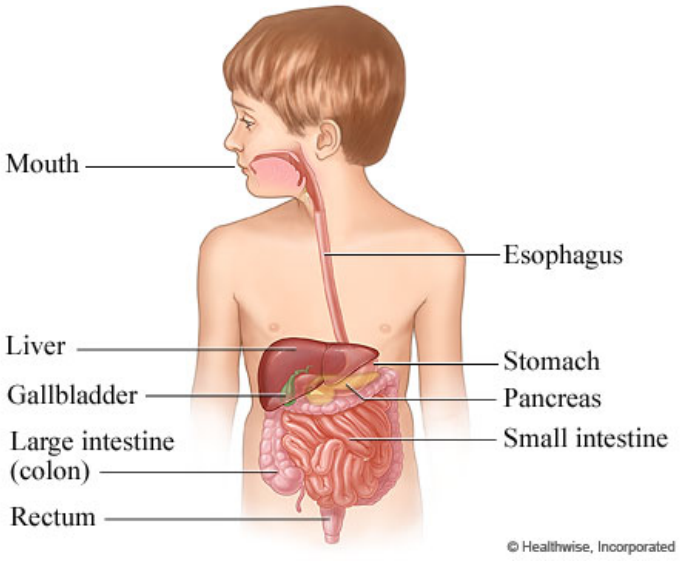
Type 1 diabetes occurs when the body is no longer able to make enough insulin for the body's needs.

The insulin-producing cells of the pancreas (called islet cells) are destroyed by chemicals called antibodies. Normally the body makes antibodies that attack and destroy foreign cells like viruses and bacteria. However, in type 1 diabetes, the body makes auto-antibodies which attack its own cells instead. Type 1 diabetes is one of the autoimmune diseases that can occur in anyone.

No one really knows why this happens. 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' (possibly a viral infection) which then switches on the autoimmune process.

This autoimmune process in the pancreas leads eventually to a total loss of insulin production.

This process cannot be reversed.



Written by: John Schulga Consultant Paediatrician NHS Forth Valley
Adapted from NHS Lothian Handbook
Date written: 31/03/2016
Date for review: 01/09/2017

Immediate Goals following a Diagnosis of Type 1 Diabetes

1. Replace the insulin which you/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 amount of carbohydrate eaten.
2. Learn how to give insulin injections using insulin pen devices.
3. Understand the use of the blood glucose and blood ketone monitor and learn to do finger prick testing.
4. Lower the blood glucose levels towards normal values (4-7 mmol/L).
5. Learn about the ways to work out how much carbohydrate is in food and drinks.
6. Learn how to deal with a low blood glucose value (known as hypoglycaemia).

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

The best way to mimic how you/your child's body previously produced insulin is to use **multiple daily insulin injections**. This is also called a basal/bolus insulin regimen.

This will require at least four insulin injections per day.

Insulin is injected into the fatty (subcutaneous) tissue under the skin. It is important to change the injection site each time an insulin injection is given.

Parents and carers as well as children quickly learn how to give insulin injections and this will quickly become part of your daily routine.

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.

Written by: John Schulga Consultant Paediatrician NHS Forth Valley
Adapted from NHS Lothian Handbook
Date written: 31/03/2016
Date for review: 01/09/2017

2. Learn how to inject insulin correctly using insulin pen devices

Correct injection technique is a vital part of diabetes management.

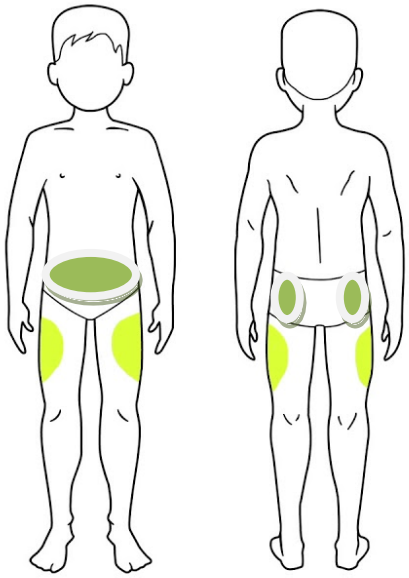
1. The technique for installing a cartridge is shown on a diagram in the box that the insulin pen comes in.
2. A new needle should be used each time an injection is given in order to reduce pain and ensure accuracy of dose.
3. 'Prime' the pen before injection by dialling up two units of insulin and make sure that you can see some liquid at the tip of the needle. You may need to repeat this a few times until you see liquid at the needle tip, particularly after inserting a new cartridge.
4. Dial up the insulin dose you are going to give.
5. If necessary, pinch the skin fold (this is important in very slim children).
   Never inject through clothing.
6. Insert the needle at a 90 degree angle straight through the skin.
7. Gently press the plunger to inject the insulin.
8. Once all the insulin has been given, **count to 10 before withdrawing the needle**. This is to make sure that all the insulin has been given.
9. Pull the needle out of the skin.
10. Release the skin fold if used. Do not rub the area.
11. Do not attempt to replace the plastic cover over the needle.
12. Dispose of the needle safely (using a sharps box, or Safeclip).

Written by: John Schulga Consultant Paediatrician NHS Forth Valley
Adapted from NHS Lothian Handbook
Date written: 31/03/2016
Date for review: 01/09/2017

Injection sites

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

- It is important to use the correct injection sites and to move around these sites regularly to avoid using the same sites all the time.
- If injection sites are not rotated adequately areas will become 'lumpy' and insulin will not be properly absorbed from the lumpy sites.
- Injection sites will be checked at clinic visits and you will be supported in learning how to check the sites.
- It is important to make sure that as many different areas as possible are used, even within the same site.



Written by: John Schulga Consultant Paediatrician NHS Forth Valley
Adapted from NHS Lothian Handbook
Date written: 31/03/2016
Date for review: 01/09/2017

Insulin storage

Insulin that is in current use can be stored at room temperature (for a maximum of one month after initial use, and within expiry date).

Make sure that insulin is not kept in direct sunlight or in areas of extreme temperature (too hot, above room temperature, or too cold, below freezing).

Keep any unopened insulin cartridges or disposable pens in an area of the refrigerator where freezing is unlikely to occur, and where the temperature is kept steady (i.e. not in the fridge door).

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

It is important to learn how to use the blood glucose meter and the finger prick device that you have been given.

It is helpful to read the information booklet that comes with your meter, so that you know how your meter works.

Written by: John Schulga Consultant Paediatrician NHS Forth Valley
Adapted from NHS Lothian Handbook
Date written: 31/03/2016
Date for review: 01/09/2017

4. Lower the blood glucose levels towards normal values

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

Insulin allows the body to use glucose for energy. By giving enough insulin the blood glucose will then fall.

The aim is to balance the correct amount of insulin with the amount of carbohydrate that is eaten together with physical activity levels.

By looking at patterns and trends in blood glucose readings we can alter the amount of insulin needed to achieve the target blood glucose readings of between 4 and 7mmol/L.

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

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

Written by: John Schulga Consultant Paediatrician NHS Forth Valley
Adapted from NHS Lothian Handbook
Date written: 31/03/2016
Date for review: 01/09/2017

What are ketones?

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

The body's fat stores are broken down because the body is not able to use glucose as energy when diabetes is first diagnosed. This results in ketones being formed. If ketones are allowed to build up to very high levels in the blood, they can make you/your child very unwell.

How do we clear ketones?

Insulin is needed to allow the body to use glucose as energy instead of using fat. When this happens, the body stops burning fat for energy, so ketone production is stopped.

Regular insulin injections will normally prevent ketone production (see Sick Day Management section if unwell).

Written by: John Schulga Consultant Paediatrician NHS Forth Valley
Adapted from NHS Lothian Handbook
Date written: 31/03/2016
Date for review: 01/09/2017

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 help you to work out your food intake, including the carbohydrate amount you normally eat, so that the insulin doses can be correctly matched with the carbohydrate.

Once you are able to work out the amount of carbohydrate you/your child eats, we can help you to work out how much insulin you need. This is known as the insulin to carbohydrate ratio.

6. Learn how to deal with a low blood glucose value (hypoglycaemia)

HYPOGLYCAEMIA or a **'HYPO' occurs when the blood glucose value is less than 4mmol/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

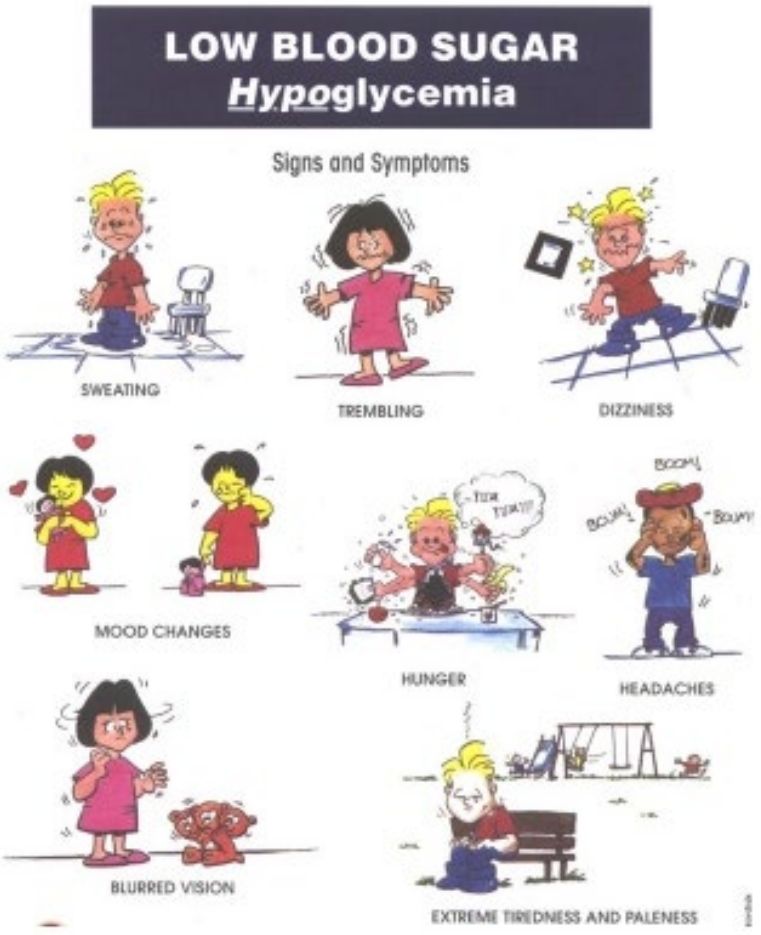
How might I feel when having a 'hypo'?

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 or symptoms!

Written by: John Schulga Consultant Paediatrician NHS Forth Valley
Adapted from NHS Lothian Handbook
Date written: 31/03/2016
Date for review: 01/09/2017



Written by: John Schulga Consultant Paediatrician NHS Forth Valley
Adapted from NHS Lothian Handbook
Date written: 31/03/2016
Date for review: 01/09/2017