Can you name the dog and why is she so important?

Your Diabetes folder

Name:

Workbook prepared by the Leeds Childrens and Young People Diabetes team with the help of children, teenagers and their families. To be used in conjunction with education programme and upbete web site.

(The workbook was funded by money raised by children and families)

Level 1: Essential reading

In Level 1 of the guide we have included information for the safe management of children with diabetes and it is primarily directed to those recently diagnosed with type 1 diabetes. At the end of this you should begin to feel more confident in managing type 1 diabetes and have covered the following topics: Try not and read it all at once just take 1 section at a time.

1. Know how to contact your diabetes team and understand what is expected from the team as well as what we ask of you.
2. Understand the routine for attending clinic and what to expect at clinic.
3. Understand the basis of type 1 diabetes.
4. How to get supplies
5. The role of blood glucose testing and how to understand the results
6. Understand the different insulin's and how to inject insulin
7. The role of food and the basis of carbohydrate counting.
8. Dealing with low blood glucose levels (less than 3.9mmol/l)
9. Dealing with high glucose levels (greater than 8 mmol/l) and illness
10. The basics of managing exercise and understanding its effect on blood glucose.

Notes

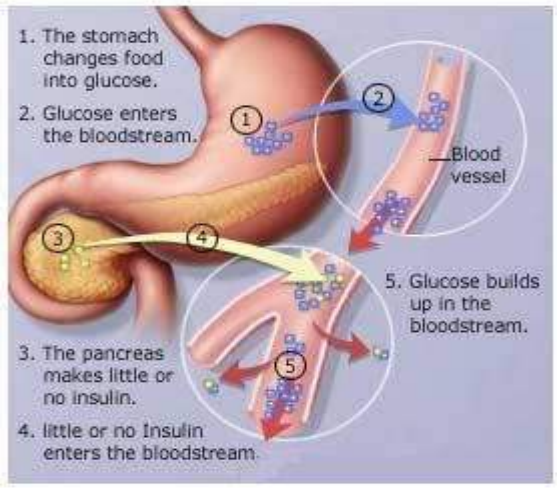
Use this page to make notes and questions you want to ask.

A1: What is Type 1 Diabetes?

The most common type of diabetes in childhood in the UK is Type 1 Diabetes, it affects about 26,000 children in the UK. Type 1 diabetes should not be confused with Type 2 Diabetes, which is usually diagnosed in adults and is associated with lifestyle factors.

In Type 1 diabetes your body loses the ability to regulate the level of glucose (sugar) in your blood due to a failure to make insulin. Glucose levels in the blood are usually controlled very accurately between about 4 to 7mmol/l.

Insulin is one of the key chemicals or hormones that regulate the body's blood glucose levels**.** Insulin is made in cells (islet cells) found in the pancreas, an organ found behind the stomach. Type 1 diabetes occurs because the body's own immune system attacks these cells. Getting good control early will help preserve some islets cells for a time, making it easier to maintain normal blood glucose levels.



Key message: Type 1 diabetes is also known as 'insulin deficient diabetes' due to the body's inability to make sufficient insulin and control glucose levels.

How Insulin Works

We know that insulin is the vital 'messenger' which helps convert the food we eat into energy, by allowing glucose to pass from the blood to all the cells in the body. The sweet and starchy food we eat and drink, *(*carbohydrates*)* are broken down into glucose (sugar*)* in the stomach and intestines; the glucose then passes into the blood stream. Insulin allows the glucose to be used as fuel for all our daily activities, even for sleeping, to ensure adequate growth and to repair cells when damaged. Insulin also transfers any extra glucose in the blood stream to muscles, fat cells and the liver to be stored until it is needed for energy.

Extra energy is required for exercise and during emergencies, e.g. when we are unwell. The body uses up the energy stored in our muscles and liver for these occasions. If the energy stores are empty due to a failure of glucose to cross from the blood to tissues, the body uses fat for energy. This explains why tiredness and loss of weight are common signs of diabetes.

Without insulin, the glucose from food and drink in the form of carbohydrates stays in the blood stream causing the blood glucose to rise; some is filtered through the kidneys and then passed out of the body in the urine, taking water from the body along with it. This explains why many children drink (polydipsia) and wee a lot (polyuria), sometimes day and night before diagnosis or if their diabetes is not well controlled. High blood glucose levels can also encourage infections.

The amount of insulin being produced by your pancreas would have been slowing down for a considerable time *(*weeks-months*)* so sometimes the onset of the symptoms may have been gradual and can often go unrecognised for some time. Occasionally the presentation can be dramatic with severe dehydration, panting (air hunger) and profound vomiting. This is diabetic ketoacidosis and requires urgent and careful treatment and is potentially life threatening.

The body now needs help to process the glucose that is taken as carbohydrates in food and drink; otherwise you will continue to feel unwell and eventually develop diabetic ketoacidosis or DKA. Insulin needs to be replaced but has to be given by injection as it does not work if taken by mouth. Insulin has to be given in a dose which matches the carbohydrate content of the food and drink we eat at meals and snacks; this is called carbohydrate counting. The dose of insulin given with food and drink is called “bolus insulin”. Your body, even when not eating, always has a low level of insulin in the blood stream. This is important to deal with glucose released from the liver and muscles and is called “basal insulin”.

Key message: The children’s diabetes team will be able to teach you how to care for diabetes and offer you ongoing help and support

A2: Diabetes supplies and medication

You will need a variety of equipment and medication to look after your child's diabetes at home. Not all of the equipment will be needed every day, but may be needed for illness management, so it is important that it is always available. This section will cover:

- Equipment and medication to be kept at home.
- How to obtain supplies.
- Storage and use.

Equipment and medication to be kept at home

Insulin - 1 box of 5 cartridges or 1 box of 5 disposable pens.

Insulin pen(s).

Pen needles - 1 box of 100 needles. (BD microfine plus 4 mm)

Finger-pricking lancets.

Blood glucose test strips.

Blood ketone test strips.

Glucogel/ Dextrogel.

Glucagon kit.

Sharps bin (5 litre)

All the above items are available on prescription. You will be given a small supply when you leave hospital but will need to obtain further supplies from your GP. The diabetes team will write to your GP and request a repeat prescription to be set up.

Your GP will also dispose of full sharps bins. If a GP refuses to do this, please ring the call centre for the clinical waste department to inform them (0113 2224406).

Additional supplies will be needed if your child is discharged home on an insulin pump. Your diabetes nurse will discuss these with you.

You will also be given a finger-pricking device, a blood glucose meter and a blood ketone meter (which may be the same device). These items are not available on prescription. Please complete and return the warranty card which comes with your meter. This will enable you to contact the meter company directly via the customer care line to arrange further supplies and discuss any problems. The diabetes nurses may be able to help with urgent problems.

Storage and use

Insulin

- Store in a refrigerator. Keep away from the cooling element. Do not freeze. Insulin will last until the expiry date when stored this way.
- Keep cartridges not in use in the outer carton in order to protect from light.
- Keep the cap on FlexPens in order to protect from light.
- Protect from excessive heat and light.
- After first opening or if carried as a spare; do not refrigerate. Store below 30℃. Use within one month.

Pen needles and lancets

- A new pen needle or lancet should be used for each blood test or injection.
- Must be disposed of into a sharps bin*.
- Store at room temperature.
- Remove pen needle after injection and store pen without a needle attached in order to prevent air from entering the cartridge
- (*This may be disposed of via GP surgery, pharmacy or through the council)

Insulin pens

- This are obtained through your Children's diabetes nurse.
- Make sure you have the correct pen for the insulin(s) you are using.
- Keep a spare at home.

Blood glucose test strips

- Store test strips at room temperature
- Do not refrigerate
- Keep test strips within the closed container or sealed in foil paper
- Do not use test strips if they have been damaged in any way or are out of date
- Some test strips require calibration. This is important to ensure results are accurate. Follow instructions that come with your meter and guidance given by your diabetes nurse.

Ketone test strips

- Store at room temperature, away from direct sunlight and heat.
- Do not use beyond the expiry date printed on the foil packet and outer box.
- Do not use if wet, bent, scratched or damaged.

Glugagon

- Store either in a refrigerator (2℃ to 8℃), or ou t of a refrigerator below 25℃ for up to 18 months before the expiry date.
- Store in original package to protect from light
- Do not freeze, to prevent damage to the product
- Use immediately after preparation - do not store for later use
- Do not use after the expiry date stated on the label. The expiry date refers to the last date of that month
- Do not use if the solution, in rare cases, looks like a gel or if any of the powder has not dissolved properly
- Smaller children will not require the full amount, your diabetes nurse will advise about this

Glucogel/Dextrogel

It is best to keep GlucoGel / Dextrogel at room temperature. If GlucoGel/Dextrogel is put in the fridge, the composition of the gel will not change but it will become thicker and harder to administer. If the Gel has been kept in the fridge, allow it to reach room temperature again before using.

Medicines should not be disposed of via the wastewater pipes or via household waste. Ask your pharmacist how to dispose of medicines which are no longer required.

A3: Professional Charter

The Children and Young People's Diabetes team aim to give as high quality service as possible, this requires trust between the family and diabetes team. Please find below what you should expect from us (Professional charter).

- We will listen to you and involve you in decision making.
- We will maintain confidentiality.
- We will support you and your family in managing diabetes.
- All children and young people will have a say in decisions about their care and in designing the services they receive.
- We will work in partnership with each child, young person and their family.
- We will always be honest and clear, even if what we have to say may be difficult.
- Each child and young person will be cared for in an individualised and holistic way.
- The team will follow a policy of 'Family Centred Care' where each child and young person will have their own named nurse.
- The team will offer the best up to date treatment based on current research, which will be delivered to the highest standard.
- We recognise the special and changing needs of children and young people with diabetes.
- We aim to empower every child, young person and their family to make informed choices by giving honest information.
- We aim to support self-management by providing knowledge & skills to each child and young person to help them take control of their own diabetes and integrate it successfully into their daily lives.
- We aim to create a relaxed atmosphere and act as advocates whenever needed.
- We will respect the value and diversity of all children and young people and their families.
- We aim to provide timely access to high quality medical, nursing, dietetic and psychological support.

A4: Child and Family Charter

To be successful in managing a condition like diabetes, where at present there is no cure but if managed well you can lead a normal active life, relies on good working relationships between the family and diabetes team and a sound knowledge base.

We want you to become 'experts in diabetes'. To achieve this not only requires commitment to following the early educational pathway but also in the long term follow up plans.

Please find below what we expect from you. This should be read by all the immediate family and discussed with your son/daughter who has just been diagnosed with diabetes depending on their age.

Please read and discuss with the team as necessary:

- A commitment to work with the team to establish a sound understanding of diabetes.
- Although we recognise the pressures of work, there requires a commitment to attend training sessions and outpatient clinics.
- If you are unable to attend clinic please phone and cancel appointment and make a further appointment as soon as possible afterwards. We aim to see you in clinic an average of 4 times per year. This may be more frequent if control seems to be slipping.
- We will download all your meter(s) in clinic-so please bring all working meters with you.
- Work with the team to achieve the best possible blood glucose control.
- Contact the team for advice and help if you feel the situation has deteriorated or you are uncertain what to do.
- The diabetes team use texts and email frequently please try and reply to them in a timely fashion.
- Try and arrive in outpatients 15 minutes before your appointment so that we can download meters and pumps in advance.
- Register with the 'UpBete' web site and use the facilities.
- Inform us of good things and bad things so that we may learn.
- Time allowing we arrange a family evening about twice a year. This is to involve you in discussions about changes in the clinic and inform you of new development-do try and attend.

B1: Glucose meters

Blood glucose meters help you to keep an accurate idea of your blood glucose levels; they are a key part of your diabetes management. Your diabetes team will discuss the different types to suit your style.

The Xceed meter will check ketones and glucose (needs different strips) and the Accu-chek Aviva expert will help calculate doses. There are lots of meters around avoid buying meters as all diabetes teams will provide meters and the results must be able to be downloaded from the meter at clinic, which not all meters can do. Examples of meters are shown but discuss with diabetes nurse what the most suitable meter is for you.

One touch meters

When you come to clinic bring all your meters as we will download them and go through the results with you. Explore your meter and look at your average blood glucose readings. Make sure your time and date is correct on the meter.

Do not forget to order new batteries from the company and take some spare on holiday.

Glucose test strips: These are special for each meter so it is important your GP prescribes the correct strips. You will need at least 4 per day and some spare. Before using some test strips you have to enter a code with each new batch, check with your diabetes nurse. Your

diabetes nurse will inform the GP of the type of strips you will require. To test blood ketones you will need different strips, this can only be done on certain machines.

For your meter to keep accurate results it is important to use it properly and keep it clean.

B2: Blood Glucose testing

Procedure for testing / supervising blood glucose test

Equipment needed: Blood glucose meter, test strips, finger-pricking device, lancet, sharps bin and cotton wool.

1. Ensure child washes their hands and dries them thoroughly. (If hands are cold, run them under warm water or shake them to warm them up).

2. Insert lancet into finger pricking device and prepare device as taught.

3. Insert test strip into or advance test strip from blood glucose meter.

4. Prick the side of the finger (it is less painful than the finger tips) and wipe away the first drop of blood with cotton wool.

5. Squeeze a small drop of blood by milking the finger from the base to the tip.

6. Hold the test strip to the blood and allow the strip to suck up the blood, or cover the test patch on the strip with the drop of blood, depending on the type of meter. The meter will beep or the display will start counting down when enough blood is received.

7. After a few seconds the blood glucose level should appear on the screen. (If an "error" appears on screen this may be due to insufficient blood sample therefore repeat the test. If problem persists, refer to meter reference guide or contact parents for advice).

8. Dispose of lancet and test strip as taught.

9. Record blood glucose result.

There are many different types of blood glucose meter, each requiring a slightly different method of use. The above is only a guide; always perform/supervise the test as taught by the children's diabetes nurse specialist.

Testing tips:

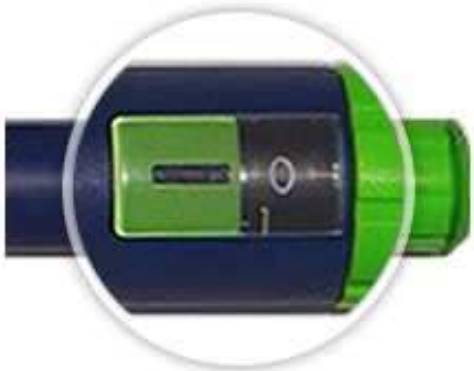
- Make sure your hands are clean before you begin. Use water rather than wet wipes (wet wipes contain glycerine that could alter the result).
- Prick the side of a finger – avoid the forefinger and thumb – not the middle, or too close to a nail, because this will really hurt.
- Use a different finger each time and a different part; this will hurt less.
- If you don't get much blood, hold your hand down towards the ground. This should make more blood flow to the fingers.
- Make sure your hands are warm – if they are really cold it's hard to draw blood, and finger-pricking will hurt more

When to test:

- Before all main meals (breakfast, lunch and tea)-this allows you to correct your blood sugar if you are high or give less if you are low.
- Bedtime to make sure you are not too low before bed.
- If you are unwell-this is essential you may need to check every 2 hours and give extra insulin if high to avoid DKA.
- In relation to episodes potentially associated with hypoglycaemia (increased exercise, alcohol ingestion)
- If suspected hypo although if this is sudden it is better to treat the hypo and then test. If uncertain it is better to check first as it can be deceiving.
- If your blood glucose has been high (greater than 8mmol/l) in the day time and you have given a correction dose-test within 2-4 hours to see that your glucose level has returned to normal.

B3: Insulin Pens

These hold 3 mls of insulin (300 units) either in cartridges or as disposable pens. Your diabetes team will advise on the best pen as it depends on the type of insulin and whether you need 0.5 unit doses or large doses.



Make sure you have a spare pen and choose different colours for the rapid and long acting insulin so you do not get muddled.

Needles

These are attached to the pen and are very fine so that it reduces any discomfort to a minimum-some people do not even feel them. They should only be used once and certainly not for more than a day before discarding. For children and teenagers the 4 mm needle is recommended.

It is important to be careful with needles and dispose of them safely in the special needle bin.

Needle bins

These can be obtained from your GP but usually have to be collected by the council when full.

B4: Injection techniques and Insulin Delivery

Giving injections to your child may seem very worrying at first. Remember you are not alone, your Diabetes Nurse or a member of the ward team will be there with you at first until you feel you can manage this without their help. By using the following guidelines every time, it will soon become part of your daily routine.

Insulin pen

Insulin

- Check that the insulin you are to use has not passed its expiry date. Once insulin is in use, it lasts for four to six weeks and may be stored at room temperature. Unopened insulin must be stored in the fridge.

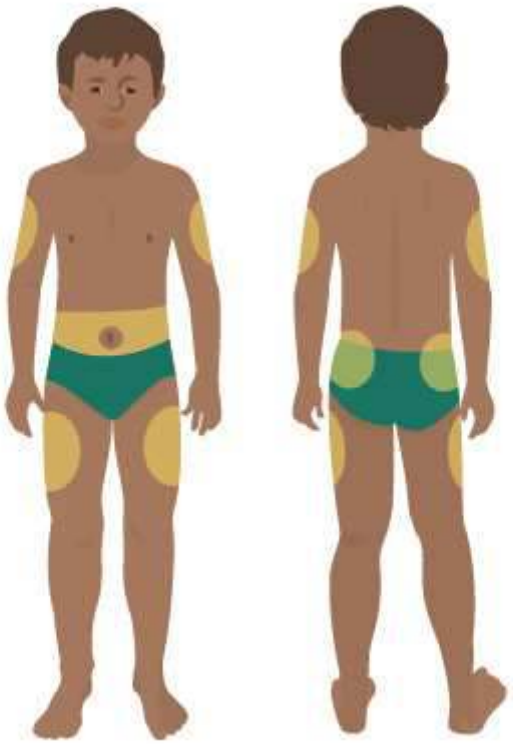
- Ensure that you give the injection in accordance with the insulin type and the manufacturer's instructions. Novorapid, Apidra or Lispro is to be given as a bolus and is usually injected 5-15 minutes before food. Long acting or basal such as Detemir or Glargine insulin is given at a set time of the day and is not related to food. Your Diabetes Nurse will advise you on what you should do.

- Premixed insulin such as Novomix 30 requires mixing by gently rocking the pen backwards and forwards about 20 times *(refer to manufacturer's instructions if you are unsure).*

Injection

- It is important to move around the area and to change sites as fatty lumps can develop if you keep using the same area. These lumps can affect the absorption of the insulin and lead to swinging blood glucose levels and poor control. You can inject into upper arms, thighs, buttocks and abdomen.

Injection sites

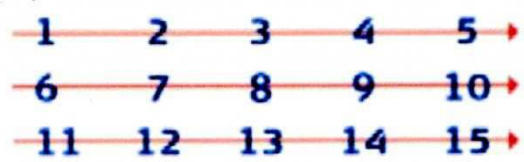


- If your child is about to go running or is playing football straight away it is a good idea to avoid injecting in the legs as it may be absorbed very quickly. Use the arm or abdomen instead.

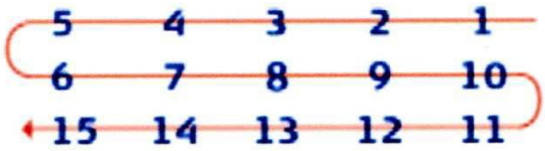
Site rotation pattern suggestions

There are a few rotation methods that help to prevent excessive use of one injection site and ensure the ideal absorption of insulin. You may choose the one that suits you best.

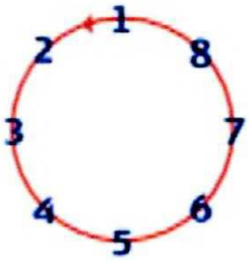
"Keyboard method" useful for abdomen and thighs



"S method" useful for abdomen and thighs



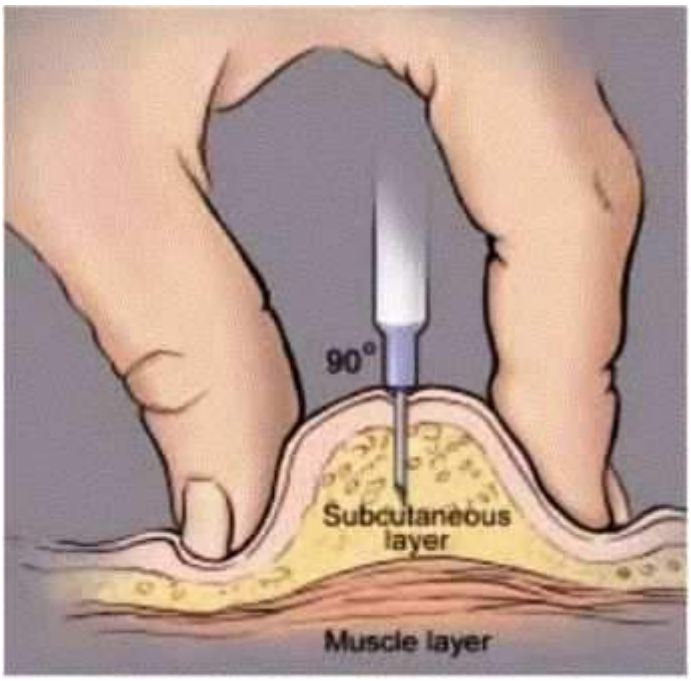
"Clock method" useful for hips and buttocks



Technique

- Remove the pen cap
- Attach a new pen needle
- Prime the needle with 2 units of insulin, holding the pen with needle upright
- Once a drop of insulin has been seen, the pen is ready to use. If a drop of insulin has not been seen - repeat the procedure
- Dial the number of units calculated to inject

- Choose the injection site and lift a wide skin fold. This helps to hold the skin steady and avoids injecting into the muscle. You may not need to lift a skin fold if using 4 mm needle.



- Inject the pen device needle at 90° and press the button/plunger as far as it will go. The dial will reset back to zero to indicate that the requested dosage has been administered
- Count to 10 before removing the pen device to reduce insulin leakage
- Following the injection, remove the pen needle using the outer cover (do not try to replace the inner cap) and discard carefully in the sharps container
- Replace the pen cap
- Always remove your needle after every injection. Your diabetes nurse will usually advise on the needle size of 4 mm

- Remember that fast bolus insulin should be injected into a different site to long acting basal insulin.

Your Diabetes Nurse will help you through this and will be able to advise you in the first few days following diagnosis.

B5: Guide to insulin regimes

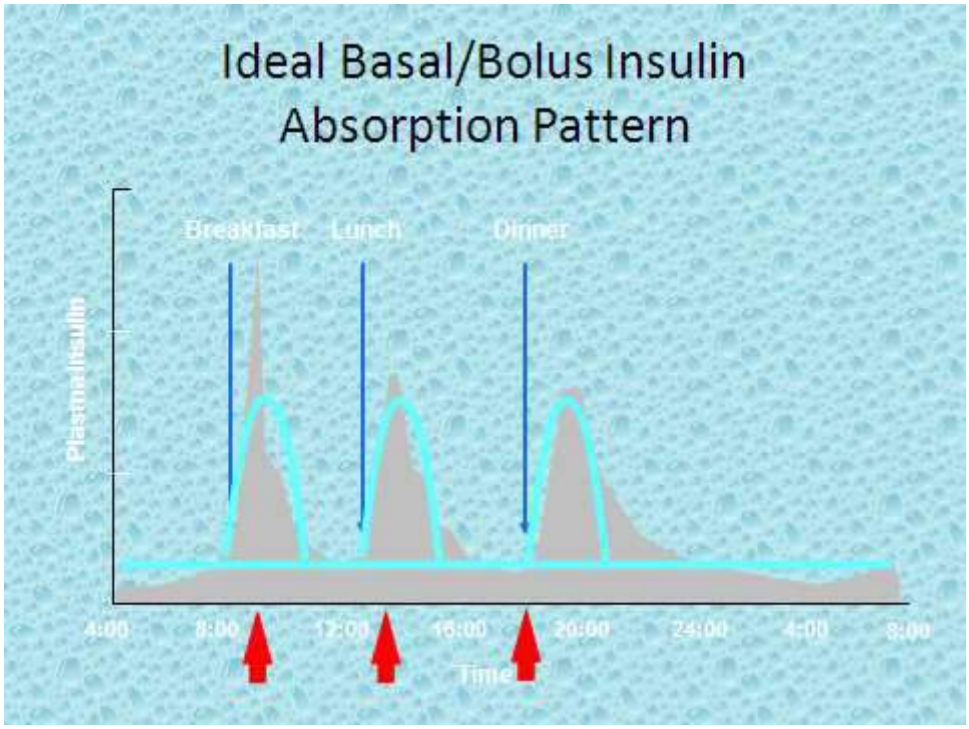
The two most common types of insulin regimes used are the **Basal Bolus regime** (also known as Multiple Daily Injections or MDI) and Insulin **Pump therapy** also known as continuous subcutaneous insulin infusion or CSII.

Both of these therapies are explained below and most families will consider the use of an insulin pump quite soon after learning the basic principles of day to day diabetes management and have a good understanding of how insulin works.

What is Basal Bolus Therapy?

This is managing the blood glucose levels with insulin injections at least 4 times each day.

The basal bolus regime uses two different types of insulin. A combination of fast acting insulin given as a **bolus** with each meal or snack and long acting **basal** insulin usually given once a day.



BASAL INSULIN (long acting insulin)

Long acting insulin such as glargine (Lantus) or detemir (Levemir) is given once daily to provide a low level of background insulin during the day and night. This basal insulin prevents the blood glucose levels rising too high in between meals and overnight. Basal insulin has a slower onset time and lasts much longer than the fast acting bolus insulin. It lasts 20- 24 hours and is usually given in the evening but is sometimes given in the morning. Occasionally two doses of basal insulin may be required and will be given morning

and evening. Where possible the long acting basal insulin should be given at the same time each day.

- long acting insulin does not work with food.
- it stops the blood glucose level from rising too high during the night and in between meals
- provides a cushion from the more immediate signs and symptoms of diabetic ketoacidosis

BOLUS INSULIN (rapid/fast acting insulin)

Rapid acting insulin such as Novorapid, Humalog lispro or Apidra or fast acting insulin such as Actrapid are absorbed more quickly than basal insulin and lasts for 3 -5 hours. They are designed to be given before food/drink containing carbohydrate (CHO) to prevent the blood glucose level from rising too high.

You will be taught how much insulin to give with meals, by learning to count carbohydrates.

The insulin to carbohydrate ratio is the calculation used to work out how much insulin to give at each mealtime. Your diabetes team will guide you of what insulin to carbohydrate ratios to use. It is not uncommon to use different insulin to carbohydrate ration at each meal.

- rapid acting insulin works best if given 15-20 minutes before food

- rapid acting insulin can also be given to lower a high blood glucose level; this is called a correction dose

INSULIN PUMP THERAPY

An insulin pump is a pager size battery operated device which delivers only fast acting insulin. It is programmed to deliver insulin in small amounts constantly throughout the day to mimic the working pancreas and this is known as the pump basal rate. At mealtimes a bolus of insulin is given by manually activating a button to deliver the mealtime bolus after carbohydrate counting. The bolus button would also be used to correct dose high blood glucose levels.

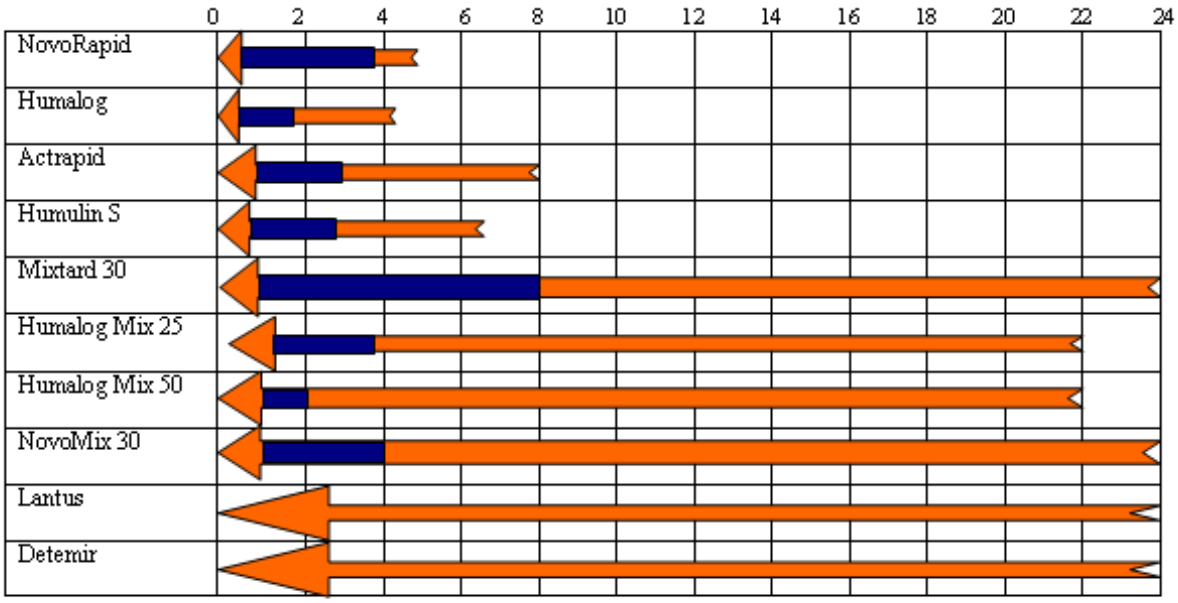
- No long acting insulin is used when using an insulin pump
- With training the pump is easy to use

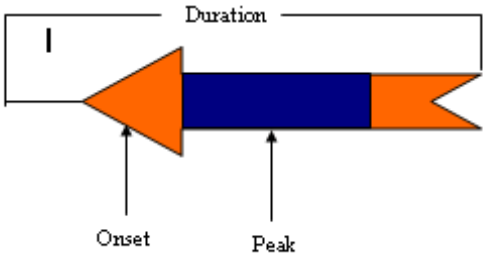
These two regime options are intensive therapies and aim to replicate the workings of a normal pancreas more effectively and allow much more flexibility for family routines and mealtimes.

Others regimes

If it is felt these multiple insulin regimes are too difficult to sustain then other regimes are available but they are more restrictive and less predictable. Premixed insulin (Mixtard 30, Humalog mix 25, Humalog mix 50, Novomix 30) are generally given twice daily in fixed doses. You do **not** carbohydrate count with these insulin's. They are generally less flexible and require a more fixed dietary regimen.

Table of time action of insulin's



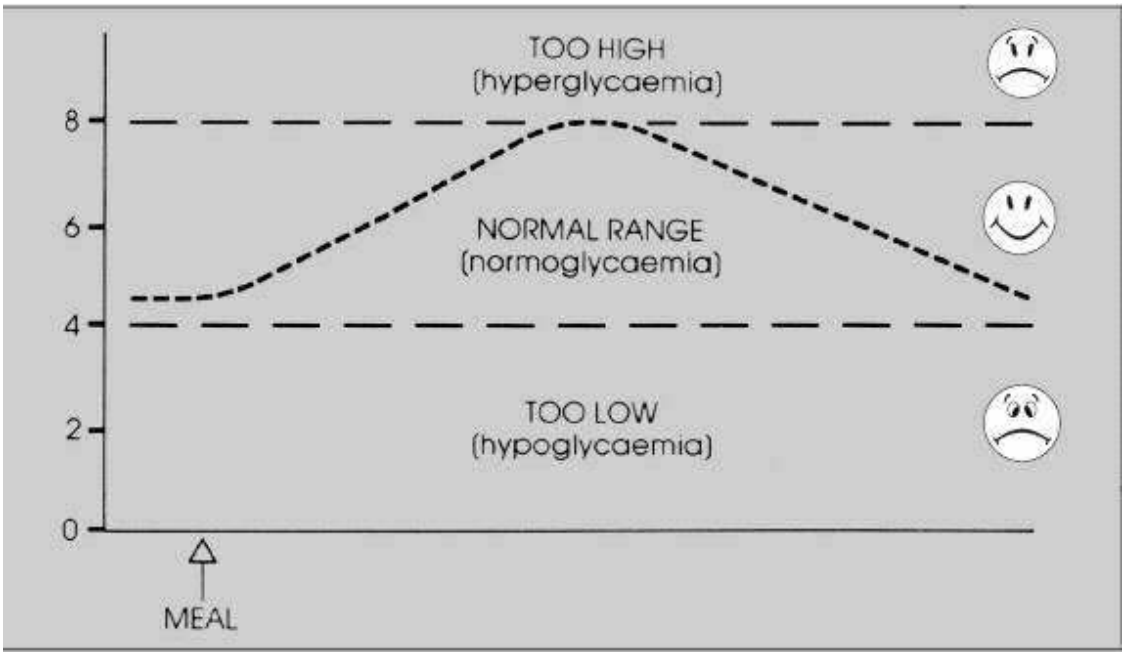


Top tips on adjusting insulin basal and bolus insulin doses can be found on the diabetes website www.upbete.co.uk .as well as the specific information leaflet.

B6: Monitoring and taking control of your diabetes

Your body works best if your blood glucose levels are not too high and not too low. People who do not have diabetes have blood glucose levels that stay between 3.5 and 7 mmol/L. If you have diabetes, good control means keeping your blood glucose levels between 4 and 8mmol/L as much as possible. Careful balancing of your insulin doses, diet and exercise will help you achieve this.

Measuring your blood glucose is the only way of knowing exactly what your levels are. If you go by how you feel, you will only know when you are very low or very high. Without any readings your diabetes team will not be able to help you so it is important to bring your meter to clinic.



MEASURING CONTROL EACH DAY

This can be done at home, school or when out and about by doing regular finger prick tests, with the equipment we will give you. (See blood glucose testing)

It is recommended that you test at least before each meal, before bed and when you feel low (hypo) or unwell. If your glucose level is high (greater than 8mmol/L) it is important to check that it has come back to normal within 4 hours.

The children who obtain excellent control test on average 5 to 7 times each day and achieve 70-80% of their results in the target range.

Extra tests may be needed at other times such as during illness, stressful periods such as exam time or during a growth spurt.

Patterns and trends of blood glucose levels that are too high or too low are more easily identified with regular monitoring.

If blood glucose levels are significantly high (14mmol/L or more) check for blood ketones.

If blood ketones are above 0.6mmol/L and rising, immediate action must be taken because you are in danger of becoming seriously ill very quickly. (See sick day rules).

THE IMPORTANCE OF MEASURING AND MONITORING BLOOD GLUCOSE LEVELS

The number displayed on the meter tells you how much glucose is in the blood stream at the time that the test was carried out. It is measured in units called millimols per litre.

Recommended blood glucose targets for children with diabetes are:-

Before meals	5 to 8 mmol/L
After meals	5 to 10 mmol/L
Before bed	6.7 to 10 mmol/L
Overnight (2 to 3am)	4.5mmols – 9 mmol/L

The blood glucose result indicates the action you will need to take to manage your diabetes well on a day to day basis.

Insulin doses are adjusted according to patterns and trends of the blood glucose levels to achieve better control.

If the blood glucose level is high e.g. 8 mmols or more before a meal then additional insulin is recommended. This is called a CORRECTION DOSE.

This extra insulin is added to the food bolus insulin which has been calculated from carbohydrate counting. Within 2-4 hours or by the next meal the blood glucose level should then return into the target range. You will be informed of your correction dose ratio by the diabetes team. The correction dose ratio will change over time as you grow.

Looking for patterns and trends of rising or low blood glucose levels, and looking for reasons will give you clues as to the changes required to get back to your target level. Before changing insulin doses you need to consider other things, such as injection sites, rotation, exercise and food (see insulin adjustments and problem solving).

EQUIPMENT YOU WILL NEED FOR MONITORING BLOOD GLUCOSE AND KETONES

1. Blood glucose and ketone meter(s)
2. Blood glucose test strips
3. Blood ketone test strips
4. Your finger pricker with lancets.
5. Cotton wool.
6. Blood glucose diary to record the result.

HOW DO I DO IT?

See blood glucose testing leaflet

MEASURING CONTROL AT THE CLINIC

We will download your blood glucose meter(s) in clinic so that we can look at the results in more detail with you. You may be able to do this yourself at home (see meter downloading) or ask your diabetes team for instructions.

MEASURING CONTROL IN HOSPITAL

During any subsequent admissions to hospital staff may need to use hospital blood glucose monitoring equipment rather than your own.

A LONG TERM MARKER OF DIABETES CONTROL IS THE HBA1C TEST

This is also a finger prick test carried out at each clinic appointment.

It measures the amount of glucose attached to the red blood cells in the blood over the last 6-12 weeks. The larger the amount of glucose in your blood, the higher the HbA1C result will be. It is measured in mmol/mol.

The recommended HbA1C level is less than 58mmol/mol, anything higher than this may mean your long term health may be affected. Your diabetes team is there to help you achieve this level. Please ask if you are not 100% sure what to do.

CONTINUOUS GLUCOSE MONITORING (CGM)

Continuous glucose monitoring may also be recommended from time to time. This is a way of analysing your glucose results in more detail and can be very informative in assisting with insulin dose adjustment, carbohydrate ratios and exercise management.

C1: What can I eat now that I have diabetes?

There is no special diet for children or young adults with diabetes. The food you eat should be based on healthy eating principles that can be enjoyed by all your family and friends. There is no need to buy any special diabetic products. The following information will explain why food is important in managing your diabetes. Your dietitian will be able to answer any other questions you might have.

Why is food important?
Just like a car needs petrol before it will drive anywhere, food is important to give us energy, so that we are able to do everyday activities like thinking, walking, running, playing, and to grow properly. When people are first diagnosed with diabetes, they often feel very tired, weak and may have lost some weight; this is because their body wasn't able to use the energy that they were eating.

How does my body use energy?
Some of the food that we eat is broken down into sugar *(glucose)* by our body. This sugar goes into the blood stream and travels around. Insulin is a hormone, produced by tiny cells in the pancreas, which lets the glucose into cells, muscles and the liver so that it can be used for energy.

In diabetes the tiny cells in the pancreas stop producing insulin, so the sugar in the blood cannot be used. This causes high blood glucose levels*(hyperglycaemia)* which can make you feel tired, thirsty and unwell. This is why insulin injections are needed, and you also need to think carefully about what you eat.

Blood glucose
Carbohydrate foods are broken down by the body into sugar *(glucose)*.

There are two type of carbohydrate

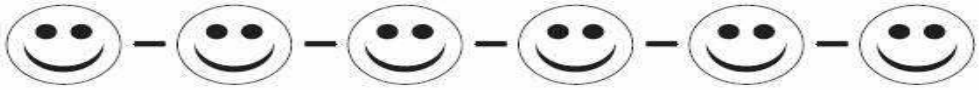
- Starchy carbohydrate
- Sugary carbohydrate

Starchy Carbohydrate
This is found in the following foods: -

Bread, potatoes, rice, pasta, chapatti, naan bread, plantain, breakfast cereals and flour.

The glucose in these foods is joined together in long chains which causes a steady rise in

blood sugar over a long period of time.



Every link must be broken before the glucose is released into the blood. Every food is broken down into glucose at different rates; however, some foods are known to be broken down more slowly than others, (e.g. beans, peas, lentils, yoghurt and milk). These are known as foods with a low glycaemic index (GI) and cause a slower rise in blood glucose. This is discussed in more detail later on.

Starchy carbohydrate foods are low in fat and help to fill you up. They should be included as part of every meal and snack *(if you need them)*. This is important to help keep your blood glucose within ideal levels.

Sugary Carbohydrate

This is found in the following foods: -

Ordinary fizzy drinks and cordial, sweets, chocolate, sugar coated cereals, cakes, biscuits and puddings.

This glucose in sugary carbohydrates is not linked together in chains.

These foods are broken down more easily which causes your blood glucose to rise quickly. Sugary foods can be included occasionally as part of your normal eating pattern. They are best eaten in small quantities as part of a meal, e.g. instead of a pudding rather than a snack between meals. Ask your Dietitian for more advice about how to include your favourite foods.

Natural sugars: these are found in milk and yoghurts, fruits and fruit juices. Natural sugars will affect your blood glucose and will need to be matched with insulin but the foods they are found in are healthy and should be included.

How does food and insulin fit together?

Blood glucose will always increase after food due to digestion and absorption, glucose levels usually peak 1-2 hours after eating. The amount of sugar and fibre in foods will affect how quickly the food is broken down and therefore the rise in blood glucose level. It is better for you to have a smaller rise in blood glucose after meals (sometimes called the

post-prandial blood glucose excursion).

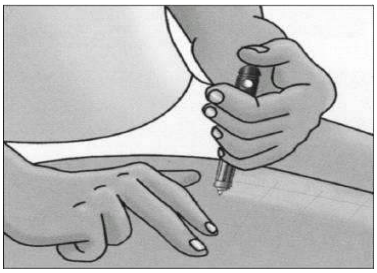
Insulin

Insulin is often given 2, 3, 4 or more times a day depending on age and lifestyle choices.

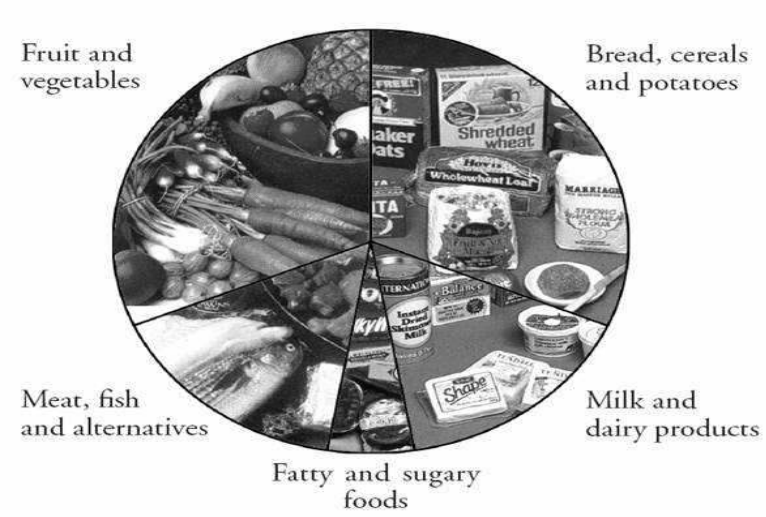
If given 2 or 3 times a day, the insulin is usually a mix of short and long acting insulin. The first injection covers the rise in glucose after breakfast and lunch. The second injection may cover just teatime or later into the night too. A third injection would provide background insulin. Not everyone will have a third or fourth injection.

On multiple daily injections 3 or more injections go with food and one provides background insulin. Insulin is matched to the food you eat; the diabetes team will explain how the insulin you have works.

If no food is eaten the insulin taken will still work and will bring the blood glucose level down too low, causing a 'hypo'. This is why it is described as a 'balance' between food, exercise and insulin.



The balance of good health
This is a useful guide to help you manage your diabetes and food. The model is based on healthy eating principles and therefore can be used for the whole family.



You need a variety of foods from each of these groups to stay healthy, and give you the right balance of nutrients, vitamins and minerals that you need.

Fruit and Vegetables

These foods are good sources of vitamins, minerals and fibre.
'Give me Five' - It is recommended that you should aim for 5 portions of fruit and vegetables daily to give you all the vitamins and minerals your body needs.

Many children may find this difficult, and may manage smaller amounts (e.g. half a banana, slices of apple and orange or smaller fruit i.e. strawberries, grapes or tinned fruit). These can be included as snacks between meals or as a pudding. Children often prefer raw vegetables to be cooked which are also great as a snack between meals, (e.g. slices of cucumber, sliced carrot, celery sticks, sugar snap peas).

The following are some more ways to incorporate more fruit and vegetables in the diet:

- Have a small glass of fruit juice with breakfast
- Add chopped or dried fruit to breakfast cereals
- Add extra vegetables to casseroles, curries, bolognaise and stews
- Add salad to sandwiches
- Choose fruity desserts, e.g. fresh fruit salad, baked apples, tinned fruit, yoghurt with extra fruit added.

Meat, Fish and Alternatives
These foods give you protein, which is necessary to help the body grow and repair body tissues. Children that are choosing two foods from this group each day will be having more than enough protein for growth.

Protein foods include:

- All types of meat, poultry and fish - fresh, frozen and processed foods
- Pulses e.g. baked beans, red kidney beans, lentils, chickpeas, mung beans, butter beans
- Soya, Quorn, TVP, Tofu
- Nuts
- Eggs

For older children, try to choose lean meats, and grill or bake foods rather than frying, to cut down on fat.

Milk and milk products
Milk, yoghurt, cheese and milky puddings are all good sources of calcium. Calcium is important for healthy bones and teeth. You should aim to consume at least a pint of milk or the equivalent amount of calcium each day *(1oz of hard cheese or 1 pot of yoghurt provides the same amount of calcium as one third of a pint of milk)*. Children under 2 years of age need full fat milk.

Choose reduced fat products for older children e.g. low fat yoghurts, semi-skimmed milk, reduced fat cheeses. Children under the age of two years should be given full fat milk as they need the energy in this to grow. After the age of two years, semi-skimmed milk may be given. Skimmed milk should not be introduced before the age of five years, unless advised by a health care professional.

Milk products such as yoghurts or milky puddings often contain sugar. Try to choose products that have no added sugar or contain a sweetener.

Fatty Foods
These foods are not essential to a healthy diet but add extra choice and variety. Fat can be seen on meat, or as butter, margarine or oil. It can also be hidden in foods such as meat products, cheese, pastries, biscuits and crisps.

Young children usually need the extra calories that fat provides. However, as they grow older it will be necessary to restrict the fat content of their diet to prevent them becoming overweight and to keep them healthy.

For children over 5 years, try choosing lower fat choices e.g. semi-skimmed milk, low fat spreads, reduced fat cheeses and grilling or baking foods rather than frying. Cut down on fatty foods *(e.g. crisps, biscuits, sausages, burgers, takeaways)*.

Sugary Foods
Sugary foods often make up a large part of a child's diet. Sweets and chocolate are often used as a reward and given on special occasions *(e.g. Easter, Christmas and birthdays)*. To try and exclude these foods altogether is unfair and unnecessary. Including these foods occasionally as part of a normal diet can help children and diabetes feel less excluded and help prevent arguments.

Your diabetic control will not be affected if these foods are included in small amounts, once or twice a week, but make sure you choose the right time. A chocolate biscuit or small chocolate bar that is eaten as a pudding after the evening meal and digested along with the main meal is not going to cause a great rise in blood glucose. However, a chocolate bar that is eaten as a snack between meals will cause a sharp increase in blood glucose.

Food for the growing years
As you get older you enter into a stage known as the 'growth spurt' or puberty. This age varies for everybody, but is usually around 10-13 years for girls, and 12-14 years for boys.

You may find that your blood glucose levels are higher than usual and your appetite is bigger, because your body needs extra energy from food to help you grow. The amount of insulin you need to take will also need to be increased.

It can be tempting to keep snacking throughout the day to satisfy your hunger, but this is not food for your blood glucose levels. Instead, try increasing the amount of starchy carbohydrate and vegetables at your main meals *(e.g. have an extra slice of bread or scoop of potato)*. This will keep you fuller for longer. Remember snacks between meals will need insulin..

Snacks
Some children may need to have a snack mid-morning and mid-afternoon to make sure their glucose levels don't drop too low. This will depend upon your age, type of insulin, and your current eating pattern. Once you are established on your insulin, you can discuss again with your diabetes team whether the snacks are necessary. However, it is important to always eat supper. Too many high fat snacks, especially when children are older, can lead to them being overweight.

If you need to take snacks, it is important that they do not contain too much sugar *(and fat)*, otherwise your blood glucose will go too high. Some ideas for snacks are included below:

Plain biscuits such as Rich Tea, Garibaldi, Ginger Nuts, Digestives, Hobnobs, Crackers, Cheddars, Ritz

Cereal bars *(low sugar)*

Fruit - any type

Diet yoghurts

Soups or cup a soups

Sandwiches

Crumpets, muffins, teacakes

Popcorn

Crisps *(low fat)*

Breadsticks

Breakfast cereal

Lots of new snack items appear in supermarkets every month, many of these may be suitable. Your dietitian has some information about food labels that will help you make sensible choices.

Notes section:

You may want to think about your favourite meals and write down any questions you want to ask the dietitian.

C2: Carbohydrate counting

Your dietitian will take you through the principals of carbohydrate counting below are ideas to help you.

What foods need to be counted?

- Those containing starchy carbohydrate:

Bread, potatoes, pasta, rice, chapattis, breakfast cereals, noodles, bread products and things containing flour, cous cous, quinoa, bulgur wheat, yams, cassava, plantain, squashes, sweet potato, parsnips, pastry, crackers

Pulse vegetables: baked beans, mushy peas, other beans, peas, chick peas, dahl, lentils

- Those containing natural sugars:

All fruits, fruit juice, fruit smoothies, dried fruit

Milk, yogurt, fromage frais, drinking yoghurt, milkshake, custard, rice pudding

- Those containing added sugars:

Biscuits, cakes, muffins, cookies, brownies, doughnuts

Sweets, chocolate, chocolate biscuits

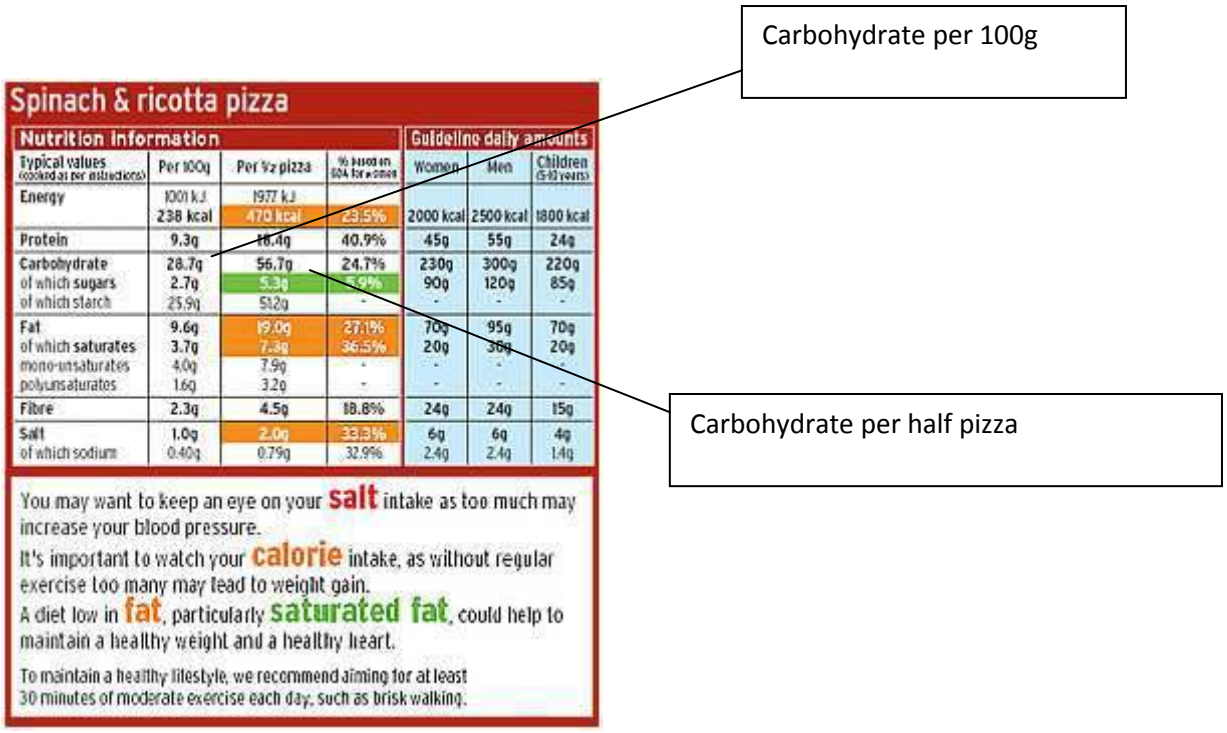
Ice cream, mousse, trifle, cheesecake, other desserts

- Plain proteins and fats are not included in calculations, although they may affect how carbohydrate is absorbed

Practical ideas

- **Food labels**

Use the nutritional labels on a product, giving values per 100g and/or per portion. You need to use the 'total carbohydrate' figure NOT the 'of which sugars'. The 'traffic light' labelling on the food packaging only gives the sugars value.



Spinach & ricotta pizza

Nutrition Information				Guideline daily amounts		
Typical values (cooked as per instructions)	Per 100g	Per ½ pizza	% based on RDA for a child	Women	Men	Children (5-10 years)
Energy	1001 kJ 238 kcal	1977 kJ 470 kcal	23.5%	2000 kcal	2500 kcal	1800 kcal
Protein	9.3g	16.4g	40.9%	45g	55g	24g
Carbohydrate	28.7g	56.7g	24.7%	230g	300g	220g
of which sugars	2.7g	5.3g	5.9%	90g	120g	85g
of which starch	25.9g	51.2g	-	-	-	-
Fat	9.6g	19.0g	27.1%	70g	95g	70g
of which saturates	3.7g	7.3g	36.5%	20g	30g	20g
mono-unsaturates	4.0g	7.9g	-	-	-	-
polyunsaturates	1.6g	3.2g	-	-	-	-
Fibre	2.3g	4.5g	18.8%	24g	24g	15g
Salt	1.0g	2.0g	33.3%	6g	6g	4g
of which sodium	0.40g	0.79g	32.9%	2.4g	2.4g	1.4g

You may want to keep an eye on your **salt** intake as too much may increase your blood pressure.
It's important to watch your **calorie** intake, as without regular exercise too many may lead to weight gain.
A diet low in **fat**, particularly **saturated fat**, could help to maintain a healthy weight and a healthy heart.
To maintain a healthy lifestyle, we recommend aiming for at least 30 minutes of moderate exercise each day, such as brisk walking.

If you are weighing food, you can use the 'per 100g' figure. The 'per portion' value is useful for quantities you can easily count e.g., per slice of bread, per biscuit, per fish finger etc.

- **Weighing foods**

This is the most accurate way to count carbohydrate in foods without labels or when the portion size varies. Foods that are good to weigh include pasta, rice, potatoes (roast, mashed, chips, jacket), cous cous, noodles, breakfast cereals, home made recipes and fruits.

You can buy scales that have the nutritional values of foods pre-programmed in, and will calculate the carbohydrate value based on the weight of food. However, these are quite expensive and you only end up using a small amount of the data you are paying for. A pair of **digital scales** and some maths will do the same job.

E.g. 100g corn flakes contains 85g carbohydrate (value from label)

My weighed portion of corn flakes is 45g

To calculate the carbohydrates in my portion

$\frac{85}{100}$ x my portion (45g) = 38g carbohydrate

E.g.100g cooked rice contains 30g carbohydrate (value from book)

If my weighed portion of cooked rice is 230g, how much carbohydrate is in my portion?

Once you have weighed a portion, keep a record of your own portion sizes of different foods to save you doing it each time. However, children's portion sizes change as they grow, so re-weigh portions every 3-6 months to check the new carbohydrate contents.

Use **Carbs and Cals book** or other portion books to estimate carbohydrate portion size, remember to take with you on holiday. Ask for a list of those recommended from the Dietician at clinic.

- A snack of 10 grams or less of CHO is acceptable without additional insulin (unless your blood glucose level rises afterwards) when on basal bolus regimen. Large snacks e.g. supper *(cereal, toast, takeaways)* or repeated small snacks must have insulin.

Is your insulin to CHO ratio enough?

Different people need different amounts and this may change as you get older. To check if you have enough mealtime insulin do the following: -

- Do a blood glucose before eating
- Calculate the carbohydrate and give the amount of insulin you think you need
- Do another blood glucose about 2hrs after eating
- Your blood glucose should be approximately the same as before the meal +/- 3mmol/L.

This works best on potato or bread based meals. If you are much higher 2hrs after and this is happening regularly, speak to the nurse or dietitian as you may need more mealtime insulin (**see carbohydrate test meal**)

Remember your ratios may differ at each of your main meals particularly during growth spurts.

C3: Favourite meals

If you have some favourite meals and you want to write them down so you don't forget, you can use this meal diary to help jog your memory.

Favourite Meal	CHO (g)	Insulin Dose (u)

D1: Hypoglycaemia

A hypo occurs when the blood glucose falls to **3.9mmol/l or below.** Hypoglycaemia is the result of a mismatch between insulin dose, food consumed, and recent exercise and is rarely, if ever, a spontaneous event.

Hypos occur more frequently:

- when the treatment regime is altered (eg increased insulin dose, increased activity levels or reduced carbohydrate intake)
- in younger children
- when there are frequent low blood glucose levels
- during stress
- in hot weather
- during sleep
- after alcohol.

The warning signs can be:

- Shakiness or dizziness
- Tiredness
- Sweating or clammy
- Headache
- Feeling hungry or tummy feels “funny”

Or you may notice:

- Pale with glazed eyes
- More moody or quiet than usual
- More badly behaved or irritable than usual
- Confused or unable to speak properly

MILD/MODERATE HYPOS are quite common in people with diabetes. A mild, easily treated hypo can be a good sign that the blood glucose level is within target most of the time.

SEVERE HYPOS occur as blood glucose levels become even lower and cause your child to lose consciousness or have a seizure (fit). Severe hypos are uncommon, but you should know what to do if this were to occur.

Treating mild/moderate hypos

The first step is to take some sugar (usually 5-15g carbohydrate) which will work quickly to raise the blood glucose level by approximately 3-4mmol/l.

As a guide, approximately 5g of glucose is needed for a 10kg child

10g of glucose is needed for a 30kg child

15g of glucose is needed for a 50kg child

(Approximately 0.3g/kg)

The amount of carbohydrate required will depend on the size of the child, type of insulin therapy, closeness to recent insulin dose as well as the intensity of any planned or recently undertaken exercise.

Food	Lucozade	Fresh fruit juice	Full sugar cola / lemonade	Glucotabs™	Glucose tablets	Jelly babies	Fruit pastilles	Honey	Jam
5g carb	25ml	100ml	50ml	1 tablet	1 ½ tablets	1	2	1 level teaspoon	1 level teaspoon
10g carb	50ml	200ml	100ml	2 tablets	3 tablets	2	3	1 ½ level teaspoons	2 level teaspoons
15g carb	75ml	300ml	150ml	3 tablets	4 ½ tablets	3	5	2 level teaspoons	3 level teaspoons

The following items are good examples:

*1x25g tube of Glucogel = 10g carbohydrate

Chocolate is NOT recommended as an effective treatment for hypos as the body takes longer to break down the lactose found in milk than it does glucose. The presence of fat further slows the rate of absorption.

Double the carbohydrate is needed with fruit juice to get the same affect as the other treatments due to the way the sugar acts in fruit juice. Fruit juices contain fructose (fruit sugar), this also takes longer to be absorbed than glucose.

Treating severe hypos

Very low blood glucose levels can lead to unconsciousness or a seizure. Severe hypos are uncommon, but it is important to know what to do if they do occur.

You must not place anything in the mouth if they are unconscious.

Place the person in the recovery position (lying on their side with the head tilted back).

If you have been trained to administer intramuscular Glucagon this can be given immediately, if not dial 999 and wait for medical assistance.

Longer acting carbohydrate

This is no longer routinely recommended in order to avoid overtreatment.

But a maximum of 20g may be considered in the following circumstances:-

Pre and post exercise

Initially lower BG levels

Insulin overdose

Post alcohol

Or if unsure

See Hypo flowchart for more detail on management

Things to consider

- Prompt treatment can prevent severe hypos.
- Make sure there is always a supply of dextrose tablets or sugary drinks.
- Monitoring blood glucose levels regularly to avoid hypos.
- Encourage children and young people to let their friends know that they have diabetes and make sure that they know what to do in the event of a hypo.
- Children and young people with diabetes should wear some form of identification.
- Is this a one off event or is there a pattern of low blood glucose levels?
- Try to work out the cause so you can try and prevent hypos in the future.
- Monitor more frequently during the next 24 hours to prevent further hypos.
- Monitor blood glucose and ketone levels 2-4 hourly if hypo and ill.

NIGHT TIME HYPOS

Many families are worried about the possibility of the blood glucose level falling overnight. In fact, low blood glucose levels are fairly common overnight and may not even disturb a child's sleep pattern.

When the blood glucose level falls, the body responds by releasing other hormones, which allow the release of glucose from 'stores' in the liver. This in turn causes the blood glucose levels to remain high for a few hours. In this case, the only sign that the child has had a low blood glucose level overnight is that that they waken up with higher than expected blood glucose levels, and may have a headache.

It can sometimes be helpful to check blood glucose levels overnight (at about 2-3am) to find out if any changes to insulin doses are needed.

If you find that night time hypos are occurring please seek further advice from your healthcare team.

When to contact the team

Following a severe hypo

If there are more hypos than usual or they occur regularly with exercise

If there is hypo unawareness or night time hypos

Always contact your team if you have any worries or questions

D2: Hyperglycaemia and treatment plan (see sick day rules for sudden high blood glucose levels associated with illness)

Good diabetes care requires establishment of some degree of routine, particularly around meals. This does not mean you cannot go out or have a picnic or do everything other families do, but it does require a little more planning. Some families find it useful to draw up a chart(s) of days-think about weekends, sports days, holidays etc.

Remember to establish a routine of testing blood glucose, calculating dose of insulin and giving insulin dose before meal if at all possible. This does require some pre-planning of your meals. Overall it is better to aim for a slightly small meal which you know s/he will eat than a big meal which s/he cannot complete. You can always give more insulin.

It is important that carers who look after your children (e.g. grandparents, aunts etc) understand this. If parents are separated, it is essential that both parents follow similar rules and understand diabetes management.

It is also important to recognise when control is slipping over time and that adjustments need to be made to keep good control. This is often associated with coming out of the honeymoon period (1 year to 18 months after diagnosis) or associated with growing particularly at puberty.

It is important to seek advice when you see this is happening and not wait for the next clinic. Consider filling 1 weeks' worth of glucose results on the glucose tracker (see upbete web site) or if you able downloading your meters/pumps and sending the results to your diabetes nurse (see example below and frequently asked questions for help).

Typical Day on basal bolus insulin					
	Breakfast	**Lunch**	**Snack**	**Evening meal**	**Bed**
Check glucose	**+**	**+**		**+**	**+**
Give insulin (bolus)	**+**	**+**	**+**	**+**	
Give insulin (basal)					**+**
Insulin to CHO ratio	**1:10**	**1:12**	**1:12**	**1:12**	
Review glucose levels	**8mmol/l**	**12mmol/l***	**7mmol/l**	**9mmol/l**	**15mmol/l****
Make a note to see if this is regularly high and consider increasing insulin ratio at breakfast, gave correction dose at lunch.** * Remembered I had a piece of cake 3 hours earlier will need to give small dose of insulin in future.**					

You may find it helpful to fill in a page and review results (see page below) or use the **glucose tracker** on the upbete web site and e mail the results over a few days to your diabetes nurse.

Typical Day on basal bolus insulin					
	Breakfast	Lunch	Snack	Evening meal	Bed
Check glucose	+	+		+	+
Give insulin (bolus)	+	+	+	+	
Give insulin (basal)					+
Insulin to CHO ratio	1:	1:	1:	1:	
Review glucose levels					
Typical Day on basal bolus insulin					
	Breakfast	Lunch	Snack	Evening meal	Bed
Check glucose	+	+		+	+
Give insulin (bolus)	+	+	+	+	
Give insulin (basal)					+
Insulin to CHO ratio	1:	1:	1:	1:	
Review glucose levels					
Typical Day on basal bolus insulin					
	Breakfast	Lunch	Snack	Evening meal	Bed
Check glucose	+	+		+	+
Give insulin (bolus)	+	+	+	+	
Give insulin (basal)					+
Insulin to CHO ratio	1:	1:	1:	1:	
Review glucose levels					

D3: Hyperglycaemia and Diabetic Ketoacidosis (DKA): Basic Guide (See Ketones and DKA for more detailed advice)

Hyperglycaemia means high blood glucose levels (greater than 8mmol/l), which if untreated and continues to rise in association with increasing ketones can lead to diabetic ketoacidosis. Action must be taken quickly and effectively to prevent DKA occurring.

Diabetic ketoacidosis with dehydration, vomiting and fast breathing is VERY SERIOUS and requires immediate review in hospital. You are more likely to get DKA if:

- If your diabetes control is generally poor and you do not check your blood glucose levels regularly.
- Miss or give insufficient doses of insulin.
- At diagnosis if the symptoms of diabetes are not recognised
- When you are unwell with a temperature and infection.
- When your insulin requirement is increasing particularly at puberty when you are growing fast.

What is ketoacidosis?
If there is not enough insulin to convert the blood glucose into energy, the body starts searching for other sources of energy, usually from the body fat. The body burns the fat as fuel and it begins to release chemicals called 'ketones' into the blood, which then appear in the urine. Ketones act as poisons in the body and if they build up to a high level this can be dangerous.

Importantly ketones contribute to '**insulin resistance**' so that you often need more insulin when you have high levels of ketones. Ketoacidosis can take from a few hours to several days to develop but it can be life threatening, so recognising and treating it in the early stages is essential.

Signs that your child may be developing ketoacidosis

- Raised blood glucose levels
- Ketones in the blood or urine (see blood ketone testing)
- Tiredness
- Smells of ketones (pear drops) N.B. Not everyone can smell ketones.
- If deteriorating and breathing fast (panting) and dehydrated.

Treatment

To prevent or reduce the risk of DKA increase the frequency of blood glucose testing if the glucose levels start to rise into double figures, i.e. above 14mmol/L.

- Check the blood for ketones using the Medisense Optium meter or if not able to check blood check the urine for ketones using Ketostix. Remember that Ketostix go out of date 6 months after opening. Always make sure you have Ketostix for holidays and bank holidays.

- A trace or a small amount of ketones may be present if your child has not been eating (e.g. because of a sore throat). Encourage him/her to drink plenty of sugar free fluids and replace food with sugary fluids (see insulin).
- If there is a moderate or large amount of ketones in the blood or urine, more insulin is needed immediately. Please ring one of the diabetes team if you are unsure about how much extra insulin to give. Encourage your child to drink sugar free fluids to help the body get rid of the ketones.
- Check for ketones during periods of stress or illness or if the blood glucose level begin to rise over a period of time, i.e. 2-3 days.
- If test is negative but blood glucose levels are high, it is likely you need more insulin. Increase insulin as advised i.e. 1-2 units working on daytime blood glucose first, leave 2 days and increase again. If your pre breakfast glucose is high this suggests that you may need more basal insulin-if uncertain phone your diabetes nurse.
- If glucose continues to rise check blood glucose every 1-2 hour and ketones every 3 hours.
- Never stop the insulin even if not eating. The usual dose may need to be increased or extra fast-acting insulin may need to be given. Please make sure that you have a bottle of fast-acting insulin (e.g. Humulin S, Actrapid, NovoRapid or Humalog lispro). Your diabetes team will have recommended correcting glucose levels over8mmol/l using a 'correction dose' this is dependent on your age and how long you have had diabetes (**see insulin sensitivity**). Remember to replace your fast-acting insulin six weeks after first using if kept out of the fridge or if the expiry date has passed, if it is kept in the fridge.
- If your child is ill, ask your GP to see him/her in case specific treatment for the underlying illness is required. If she/he is not eating, replace carbohydrate foods with sugary liquids as advised on the illness leaflet. Insulin should be given with the glucose containing drinks together with correction dose. Other non-sugary drinks should also be offered to help the body to get rid of the ketones. Even if your child does not feel like eating it is essential that they have carbohydrate and insulin to be able to get rid of the ketones.
- **Diabetic ketoacidosis:** Vomiting, stomach ache and headaches can occur if ketones are present in the urine. **This can lead to the child becoming confused, very pale, with dull and glazed eyes, dehydrated and cold and becoming drowsy.** It may be that there will not be sufficient blood in the fingers to get a true reading of blood glucose levels. **Hospital admission urgently is required.**
- **Severe Diabetic ketoacidosis:** In severe dehydration finger prick blood glucose levels may underestimate the glucose level, **it is essential to look at your child's symptoms and not just act on the blood glucose level.** If there is a large amount of ketones in the blood or urine and the symptoms described above are present, bring your child immediately to hospital or ring for an ambulance. Please inform the ward that you are coming if you have time or we will do so if we have spoken to you.

D4: Ketones and Diabetic Ketoacidosis (DKA)

If you have diabetes and become unwell or have high blood glucose levels of 14 mmol/L or ore please check for ketones

If the body does not have enough insulin its energy levels will fall, the body stores its energy inside cells as glucose but it needs insulin in the correct amount to do this.

When insulin levels are insufficient the body breaks down fat to produce the energy it needs, chemicals called KETONES are made as a by product of this process. **Ketones are acids** and if this acid level rises too high this can be very dangerous if you have diabetes.

Ketosis describes the increased level of ketones in the blood. Prompt action is essential to avoid hospital admission and treatment with intravenous insulin and fluids.

Ketoacidosis describes how acidic the blood has become because there is NOT enough insulin in the body.

Ketoacidosis can be dangerous and life threatening and can develop within a few hours, especially for insulin pump users. IMMEDIATE ACTION IS REQUIRED.

Increasing ketone levels affect the function of the heart, lungs, digestive system and brain and in the worst situation can cause coma and death.

Recognizing the signs and treating early is **essential:-**

EARLY Signs that your child is developing ketoacidosis

- Blood glucose level is rising and typically greater than 14 mmol/L
- Ketones are present in the blood or urine (see chart below)
- Confusion
- Tiredness
- Increased thirst
- Becoming dehydrated

LATE signs that your child has developed or is developing ketoacidosis

- Nausea
- Vomiting
- Headache
- Abdominal pain
- Breath smells of acetone /pear drops
- Deep/Sighing breathing * **Seek Urgent Medical Attention**

Ketoacidosis is always caused by insufficient insulin please check ketones:-

- If your child is acutely ill or feeling unwell
- If the blood glucose has been higher than 14 mmol/L for a couple hours
- If your child feels sick or has vomited
- If your child is feeling under stress
- If you are on an insulin pump you are at greater risk of developing ketoacidosis because you only have a small depot of fast acting insulin and you no longer have any long acting insulin working in the background. Pump users must be more vigilant and test for ketones after any raised blood glucose result that has not been resolved by one correction dose by the pump. For pump users please follow these rules:

  Check ketones

  Correction dose by pen if the ketones are present

  Change your pump to a new site

  Check you had not run out of insulin?

  Check your old cannulae were not bent?

  Check for air in your line?

  Confirm ketone level after 2 hours is 0.6mmol/L or reducing

  Contact diabetes team if no improvement

Measuring ketones at home using a blood ketone monitor

Ketones can be measured at home by a simple finger prick blood test

We highly recommend the use of the blood ketone monitoring equipment especially if your child is unwell. This result is more accurate than the urine ketone test. The results from this simple finger prick test will tell you if your ketone level is normal or elevated. The higher the result the quicker you need to act. This result can tell you if you have diabetic ketoacidosis. Please refer to the guideline chart below to help interpret the results but if unsure contact your diabetes team for immediate advice.

Delayed treatment for high blood ketone levels can be life threatening. Identifying rising ketone levels early can avert an emergency situation or hospital admission. If identified early and with appropriate advice and treatment from the diabetes team ketone levels usually decline into the safe range. Managing this may take up to 24 hours and requires extra insulin doses and careful observation of fluid intake and regular telephone contact. Individual assessment is essential and in some cases admission to hospital may be unavoidable.

If your child is unwell please establish if it is the diabetes causing the symptoms from ketone production by checking the blood ketone level. If the blood ketone level is below 0.6mmol/L and the blood glucose is less than 14 mmol/L this indicates the insulin level is fine and it is likely to be some other underlying illness causing the symptoms.

BLOOD KETONE LEVELS - WHAT I NEED TO DO

Think of the results like a set of traffic lights

Green: blood ketones in the normal range

Amber: blood ketones please be careful

Red: blood ketones very high risk of ketoacidosis

Blood glucose level	Blood ketone level	What do I do
Starvation Ketones *can occur when the body is starved of glucose for prolonged periods of time. The blood glucose level is usually normal or no greater than 10 mmol/L*	*Starvation ketones are made from fat just the same but the levels do not usually rise above 1.0 mmol/L*	▪ *Eat a carbohydrate meal and give usual insulin.* ▪ *Retest after four hours and the ketones should have gone.* *N.B. It can be normal to have a small amount of ketones in the blood this is harmless*
Blood glucose 8-14 mmol/L	Blood ketones below 0.6mmol/L	The ketone level is in the normal range. ▪ Give a correction dose to get back to your target blood glucose level if needed ▪ Recheck Blood glucose and ketone in 2hrs ▪ Important tro have CHO as usual with insulin.
Blood Glucose 14 mmol/L or more	Blood Ketones below 0.6mmol/L	The ketone level is in the normal range ▪ Correction dose is needed for high blood glucose level ▪ Give extra sugar free fluids ▪ Recheck Blood glucose and ketone in 2 hours as the level may improve without any further extra insulin. ▪ If glucose level still high give some extra fast acting insulin as correction dose as per your personal instructions. If ketone level rising see below. ▪ Important to have CHO as usual and appropiate insulin, if not hungry use liquid exchanges. ▪ If unsure contact the diabetes team

Blood Glucose 14 mmol/L or more	Blood Ketones between 0.6 and 1.5 mmol/L	The ketone level may become serious without extra insulin. ▪ Give extra insulin immediately. Pump users to give using a pen injection and re-site pump needle. ▪ Recheck blood glucose and ketones in two hours. If unsure of how much further insulin to give then contact the diabetes team. ▪ Give extra sugar free fluids. ▪ Recall diabetes team in 2 hours with update and for ongoing advice Despite these actions your child could deteriorate very quickly into the high risk category -**any signs of nausea, vomiting or abdominal pain seek advice immediately** or take to the accident and emergency department
Blood Glucose greater than 14mmol/L	Blood Ketones above 1.5mmol/L is high risk.	The ketone level is high. Your child is at risk of developing ketoacidosis and dehydration watch for signs of abdominal pain and vomiting. High ketones levels will mean your child will no longer feel hungry but you MUST ▪ Give extra insulin and recheck blood glucose and ketones in one hour. ▪ Contact the diabetes team to advise you on the dose. ▪ Encourage sips of sugary fluids with insulin. ▪ After two hours repeat the dose if ketones have not decreased and take child immediately to the accident and emergency

BLOOD GLUCOSE LEVEL MAY OCCASSIONALLY BE NEAR NORMAL but USUALLY HIGH	**Blood Ketones above 3.0mmol/L is serious Risk**	**The ketone level is seriously high. Your child needs insulin immediately and a rapid assessment of severity of ketoacidosis. TAKE TO EMERGENCY DEPARTMENT IMMEDIATELY** **If dehydrated and breathing fast it is very unlikely that further insulin under the skin will work-hospital admission is required. If at night do not wait until the morning but seek advice immediatly.**

NEVER stop giving your insulin if you are unwell or have ketones.

It is not advisable to exercise if you have ketones and high blood glucose levels.

Thus leaflet is specifically to explain ketones and its potential effects please refer to the illness management leaflet for more specific illness advice or contact team.

URINE KETONE MONITORING (Blood ketone is more reliable and accurate)
Urine ketone checks are best kept for occasional screening if trends of high blood glucose levels occur.

Use a test called Ketostix.

- Ketostix expire after 3 months of opening so to ensure accuracy make sure they are in date.
- Dip the stick into a fresh urine sample then time for 15 seconds.
- Compare the stick against the colour chart on the side of the bottle.
- If the pad does not change colour the result is negative to ketones.
- The darker the colour pad changes the higher the ketone level
- Extra insulin is required for positive ketone test
- Please contact the diabetes team for an assessment and recommendations of treatment.

E1: Sick Day Rules

Introduction

Blood glucose (BG) comes from two sources:

- From the digestion of food
- Manufactured in the liver by the body itself

Your body will continue to produce its own BG, even when you do not eat. If there is insufficient insulin, the glucose cannot get out of the blood and into the cells.

BG levels will rise **particularly at times of illness** and especially if you have a high temperature. Stress hormones also mean more insulin than usual will be needed to stay in control. This means it is **more important than ever** to monitor your BG and make sure you keep your BG under control.

If your BG is normal but ketones are present, this is more likely to be starvation ketones. Regularly take carbohydrate containing fluids (with insulin) to switch off ketone production and non-sugary fluids to help flush the ketones out of the body.

Hyperglycaemia

Hyperglycaemia generally means a glucose level of 14mmol/l but symptoms may not become noticeable until values are 15-20mmol/l.

The following may specifically cause high blood glucose levels and should be considered when trying to identify the cause:

(N.B. If you have just eaten within the last 90 minutes recheck in 1 hour, as you may not have had enough insulin for the amount you ate).

Increased insulin requirements:

- Infection/ illness
- Growth
- Stress
- Reduced exercise

Infusion/ Injection sites:

- Inflammation
- Insertion/ injection into a hardened / lumpy area

Insufficient insulin:

- Basal insulin too low
- Forgot to give a bolus of insulin
- Too little bolus for the food eaten
- Too much CHO after hypoglycaemia
- Rebound following hypoglycaemia

See key points below for managing high glucose levels:

Key points

- NEVER stop taking your insulin – more than usual may be needed even if you are unwell and not eating as much as usual.
- If you are nauseous or vomiting, this could be a sign of Diabetic Ketoacidosis (DKA) – DON'T DELAY - CHECK Ketones and if present phone the Diabetes team for help
- Test your blood glucose and ketones every 1-2 hours
- More insulin than usual will be needed if ketones are present.
- Correction doses should be given every 2-4 hours until glucose is normal and ketones are less than 0.6mmol/l
- Consider increasing the long acting insulin depending on the illness type and if the duration is likely to be two or more days.
- Replace food with small amounts of carbohydrate containing liquid if not hungry e.g. fruit juice, ice cream, yoghurt, sugary drinks
- Don't forget water or sugar free drinks are needed too.
- Contact the Diabetes team **URGENTLY** if your child is vomiting or you are at all unsure.
- Contact your GP for general care of the illness. If medications are prescribed, it is a good idea to request a "Sugar free" type. If not, the amount contained is negligible and can be corrected when you give your next insulin dose.

Seek advice from the Diabetes team early if you are uncertain what to do.

Key Point: If you think your child has a temperature or is developing an intercurrent infection (e.g. sore throat, chickenpox etc.) it is more important than ever to monitor glucose levels and to correct high levels.

Levels of blood ketones - Traffic light alert

Less than 0.6 mmol/l	0.6 - 1.5 mmol/l	Greater than 1.5 mmol/l
Green (okay)	Amber (warning)	Red (needs taking care of)
No action	Correction via pen and more frequent monitoring	As for Amber PLUS Urgent medical assistance

Signs & Symptoms of DKA –Urgent advice is needed if:

Ketones in the blood are over 1.5mmol/l

Vomiting and unable to keep anything down

Abdominal pain

Feel drowsy with heavy laboured breathing

Breath smells of pear drops

See Contact details for telephone numbers or call ambulance. Do not sit at home seek advice.

E2: Understanding Ketones: how to prevent ketones and avoid DKA

If you starve for more than a few hours, the body will run out of glucose (sugar) stores and will switch to breaking down fats and produce ketones. Ketones smell like pear drops and are found in your breath and urine, which is how the body tries to get rid of them. They are toxic and can make you very ill.

Insulin is important as it acts as a key to allow glucose to move from the blood into the cells, where it is used for energy. If you have diabetes and do not have enough insulin, the body cannot use the glucose and switches to breaking down fats for energy, which leads to ketone production.

If this is not treated, the blood becomes acidic and can lead to diabetic ketoacidosis (DKA) where you will feel very thirsty, start breathing fast and become very dry and vomit a lot.

Situations where large amounts of ketones are produced

Poor diabetic control with high HbA1c:

In this situation, you don't have enough insulin and have high blood glucose levels most of the time. As there is not enough insulin, the glucose stays in the blood stream and can't get into the cells to make them work properly. If you then become unwell, miss insulin or exercise very hard, it can quickly make the situation worse.

Intercurrent illness:
This can be any illness such as flu, tonsillitis or chickenpox. If the body becomes unwell in these situations, it works much harder (equivalent to running very fast) and demands more glucose. Although blood glucose levels rise, the glucose is in the wrong place (in the blood and not in the cells) and the body needs both more glucose and more insulin to deal with the stress of illness.

Starvation:
If you miss food, particularly carbohydrates, the body will naturally form ketones. This will happen more quickly if you are unwell or your diabetes is not well controlled.

Exercise:
Exercise is good for you but if your blood glucose is high and ketones are present, the situation will become worse if you exercise suddenly. The body will demand more energy sources and if there are not enough carbohydrates, more fats will be broken down to form ketones.

How to prevent ketones and DKA

General points:

- Try to eat sensibly and regularly. Although there is no harm in missing occasional meals, in general you should not do this too often. A healthy mixed diet which always contains carbohydrates (CHO) will help to prevent ketones.
- Try not to forget insulin. Those on pumps or multiple insulin injections should try to be accurate with carbohydrate counting and remember to bolus.

- If you test your blood glucose levels regularly, you can correct them if they are high (above 8mmol/L)
- If you monitor your blood glucose levels and they are high (in double figures) a lot of the time, you need to think about changes in your insulin doses. If you are not sure, discuss what action needs to be taken with your diabetes nurse.
- The presence of high levels of ketones makes your insulin work less effectively, this is called insulin resistance. It may be necessary to give increasing doses of insulin or temporarily increase the basal rate if you are on a pump.

Illness:

- Often you do not feel like eating when you are unwell. If this is the case, you must have liquids to match what you would normally eat. This might be Lucozade, milk or fresh orange juice. If you cannot drink, suck glucose tablets instead of the carbohydrates you would normally eat. (3 glucose tablets are usually about 10 grams of CHO). **NEVER** stop taking your insulin if you are not eating.
- You usually need more insulin when you are unwell. Monitor blood glucose levels and take your insulin regularly. For those on a pump or multiple insulin injections, give correction boluses of insulin if your blood glucose is high (8mmol/l or above). For those on twice daily insulin, you may need to increase your normal dose or give some fast acting insulin at lunch.
- If you start vomiting, particularly if you have high blood glucose, are passing a lot of urine, feel cold and breathing fast, you must seek **very urgent** advice and come into hospital immediately.

Ketone monitoring:

- Ketones can be checked in both blood (ketone test strips) and urine (ketostix) but blood ketone testing is more accurate and tells you what is happening now rather than a few hours ago. If you use a pump, you **must** test your blood ketones if your blood glucose is above 14 mmol/l or you are unwell (see chart below).
- If ketones are present, you need to drink plenty of sugar free fluids to flush them out of your body. You also need to eat carbohydrates (or have drinks containing CHO if not eating) with adequate insulin, and correct high blood glucose levels with extra insulin in order to stop ketones from being made. Blood ketone levels above 1.5 mmol/L or urine levels moderate to high require urgent treatment.

Less than 0.6 mmol/l	0.6 – 1.5 mmol/L	Greater than 1.5 mmol/L
Green (okay)	Amber (warning)	Red (needs taking care of)
No action	Correction via pen and more frequent monitoring	As for Amber PLUS Urgent medical assistance

F1: Upbete- on line support for children and families with diabetes.

Register with www.upbete.co.uk and once your registration has been processed you will have full access to the on-line support service. The site was designed by children with diabetes and their parents together with staff of the Leeds Children's Diabetes Service, myknowledgemap and the educational unit of the University of Leeds. It can be shared by diabetes teams across the country and your own diabetes team has its own section.

The online support consists of two sections:

1. Open access section consisting of 4 domains containing very basic information on diabetes and support and help for schools and friends.
    a. About diabetes
    b. Food and Diet
    c. Schools
    d. Friends and families
2. Members section which is specific for your clinic and will enable you to have:
    a. Access to information literature (resource library)
    b. Use of glucose tracker to help you make decisions about your blood glucose levels.
    c. Forum for parents and children
    d. Shared recipes
    e. Lunch book carbohydrate calculator.
    f. Contact details for your clinic.
3. Information can be shared with friends and families, schools are encouraged to register as well

F2: Exercise

More detailed explanation is found in Level 2 of the workbook. Some basic points are listed:

- Your insulin regimen is planned around the standard day and should be fine for most days. This sometimes needs changing in relation to increased or decreased exercise above or below normal.
- Activity is important as part of a healthy lifestyle and should be encouraged
- During activity you are aiming to keep your blood glucose around 7-8mmol/l. This may require some increased glucose testing and experimenting before you get it exactly right. As a general rule activity is associated with a lower insulin requirement and a fall in blood glucose before or after the exercise depending on intensity and length of the time exercising.
- Increased activity for less than 30 minutes may need a little extra carbohydrate
- Increased activity lasting more than 30 minutes usually requires reduction in insulin and/or increased fast acting carbohydrate.
- Drink plenty of water during exercise.
- If you are exercising for 60 minutes or longer you will need a snack during the exercise. (e.g. at half time in a football match)
- The snack required will depend on pre activity glucose levels and type and intensity of activity. As a general rule start by trying 15g of Carbohydrate for each 30 minutes of activity.
- Suitable snacks include
    - Sports drinks
    - Jelly sweets
    - Ordinary sugar containing drinks
    - Dried fruit.
- After exercise particularly prolonged intense exercise you may go hypo up to 12 hours afterwards and you are more sensitive to insulin. It may be necessary to reduce your insulin to carbohydrate ratio. This is particularly important with evening exercise followed by going to bed.
- High blood glucose levels after exercise are best rechecked 30 minutes later and then give half usual correction if still high.

G2: Contact Details.

The Leeds Childrens' Diabetes Team

How to contact us

Telephone: the diabetes team may be contacted in office hours on the following number:

0113 2064996 Where our secretary, Julie Hobbah, will be happy to take your call

Advice Line

This is available for emergency advice on weekdays between 5 to 8pm

07766 440618

After 8 pm at weekdays and at Bank Holidays, please contact the Leeds Children's Hospital

Ward L30 (Old ward 51): 0113 3927430

Important numbers:

Appointments: 0113 2064966/2065200

Hot foot phone line for urgent foot health advice

Mon - Fri 8 a.m. to 3 p.m.07786 250788

Children's Diabetes Nurses

Wendy Sewell (Team Leader) gwendoline.sewell@leedsth.nhs.uk

Mob 07786250730

Carole Gelder (Clinical educator) carole.gelder@leedsth.nhs.uk

Mob 07810754228

Carol Bacon carol.bacon@leedsth.nhs.uk

Mob 07786 250743

Julie Cropper julie.cropper@leedsth.nhs.uk

Mob 07786 250727

Jane Exall jane.exall@leedsth.nhs.uk

Mob 07786 250744

Melani Hill melani.hill@leedsth.nhs.uk

Mob 07887954603

Caroline Mullier caroline.mullier@leedsth.nhs.uk

Mob 07786250725

Dietitian: Frances Hanson 0113 2064996 or 0113 3923507

www.frances.hanson@leedsth.nhs.uk

Psychologist: 0113 2065897

Diabetes team address:

Children's Diabetes Team Room 064

First floor Children's Day Hospital

St James's University Hospital

Beckett Street

Leeds LS9 7TF

Consultants: Dr. Philip Holland, Dr Fiona Campbell, Dr James Yong

G2: Ongoing Support

Home visits

You will be offered a home visit shortly after discharge from hospital. The dietitian may also be able to make a visit with your specialist nurse.

How often your nurse will visit will be decided by you and your named nurse. Usually after the first couple of visits, we see you either in clinic or in our dedicated education centre at the Children's Day Hospital

School visits

If your child attends school or nursery we will go into school shortly after discharge to teach staff how to look after diabetes in school. It is helpful for parents and children to attend this first meeting so that a care plan can be discussed. Parents will need to go into school initially until the designated staff have learnt how to administer/supervise the insulin injections or bolus via an insulin pump.

Structured Education

You and your child/young person will be invited to attend structured education group sessions. We hold regular sessions for newly diagnosed children and their families as well as further update sessions. The classes include subjects like carbohydrate counting, exercise and lifestyle management and insulin pumps.

Attendance at these is a really important part of diabetes care. Learning as much as possible about diabetes helps achieve much better control.

Psychology

A diagnosis of diabetes is a big event and it is normal to experience a number of feelings such as sadness, being shocked, angry and upset. If these feelings continue and you and your child find it hard to deal with these, we have a psychologist who is a member of our team and can help with motivation to look after the diabetes. Your diabetes nurse can talk to you about this.

Annual review

Clinic attendance is usually every 3 months. Sometimes you will be asked to attend monthly if the diabetes is difficult to control. One appointment each year will be an annual review. At this appointment as well as weight, height, HbA1C and meter downloads, the following will be performed:

- Injection sites checked
- Feet looked at and foot care advice
- Education update
- Blood sample taken to check for coeliac disease, thyroid problems and other blood levels such as cholesterol
- Urine sample taken to check for protein
- When over 12 years we will begin to talk about healthy lifestyle issues such as smoking and alcohol
- Retinal screening

If you have any questions or worries about these checks then please don't hesitate to discuss them with the diabetes team

Dental Health

Caring for teeth is also an important part of good diabetes care.

Brushing twice a day with a small headed toothbrush and a pea sized amount of tooth paste will help to remove all the debris from food that causes plaque, a sticky film of bacteria that causes gum disease.

Children under the age of 7 will need help and supervision.

Visiting the dentist regularly for check ups, preventative advice and treatments will help to keep a healthy smile. Remember to tell the dentist that your child has diabetes. Ensure that your child eats normally before their appointment in order to reduce the risk of hypoglycaemia. Morning appointments are preferred.

If a general anaesthetic is required for treatment then your child would be referred to a specialist dentist.

Foot care

The blood vessels supply oxygen and nutrients to the muscles and nerves. The blood vessels in the feet can be damaged by persistent high glucose levels. This means that they cannot supply enough oxygen and the nerves can be damaged. This causes reduced sensation in the feet, so that small injuries that are usually noticed are not felt.

Because of this, good foot care for children with diabetes is important

We would advise the following

- Wear slippers or shoes at all times
- As children's feet grow quickly, check that shoes and socks are well fitting
- Check for blisters and cuts and see a doctor if they are not healing
- Seek advice for infections such as athletes foot, verrucae or ingrowing toe nails

If you have an **urgent** foot problem there is a hot foot phone line for advice Mon- Fri 8 am to 3 pm **07786 250788**

Alternatively, a member of the diabetes team can refer your child to the podiatrist.

Disability Living Allowance

All children with diabetes are eligible to apply for the Disability Living Allowance. This is non means tested and does not mean that your child will be registered disabled. The payment is to help with the extra care and attention that children with diabetes require. It is not usually paid to children over the age of 16, unless there is another medical condition.

You may obtain forms from the benefits agency on **0800 882200.** Alternatively you can complete the forms online. Your specialist nurse will be able to help you.

Diabetes UK

This is a charity helping people living with diabetes. It is free for children and families to join for the first year. They provide support and information for people with diabetes, their families and also have a professionals section. We would advise joining Diabetes UK as they organise link weekends for children and families and provide holidays for children of different ages. They have a care line and online information on their website www.diabetes.org.uk

JDRF

The Juvenile Diabetes Research Foundation is a charitable organisation that funds research into diabetes. They are committed to fundraising and increasing the awareness about the condition and provide information and resources such as the “Talking T1” toolkit for raising awareness

G3: Parents and Children's Diabetes Support Groups.

The specialist diabetes nurses will talk to you about local support and will give you appropriate contact numbers. The possible options are listed below:

1. If you want to be paired with another parent in your area to discuss how you are doing and share ideas, then discuss this with your Diabetes nurse and she will arrange an appropriate contact.
2. There is a local support network run by Sheonagh Clarke, if you would like to be put in contact let your diabetes nurse know.
3. On our website there is a forum for parents and children to share ideas. (www.upbete.co.uk). You need to log on and complete the registration form, which needs to be validated before you use the forum
4. Diabetes UK Leeds Chairman is Lawrence Glyn he can be contacted at diabetesleeds@hotmail.co.uk.
5. Juvenile Diabetes Research Foundation has a local Leeds branch run by Chris Normington. (ask diabetes nurses for details)

G4: Important information you may need to write down and keep where you can see it e.g. pinned to your fridge.

Important information on your insulin regimen.

Date last changed:

My insulin to carbohydrate ratio at **breakfast** is 1 unit of insulin to: _____ grams of CHO

My insulin to carbohydrate ratio at **lunch** is 1 unit of insulin to: _____ grams of CHO

My insulin to carbohydrate ratio at **evening meal** is 1 unit of insulin to: _____ grams of CHO

My insulin sensitivity or correction factor is 1 unit of insulin for every _____ mmols/L of blood glucose above 7mmols/l.

My long acting insulin is called Glargine/Detemir and the dose of long acting insulin is:_____ units and I give it at _____ (time).

My glucose tablets are stored:_____

My glucagon kit for emergency hypo treatment **is in the fridge** (check expiry date).

Section for added comments

G5: Clinic Information for Children and Young People with Diabetes

Children

The children's clinics are held on the First Floor of the Children's Day Hospital, St James's University Hospital. You will see members of the Children's Diabetes Team, usually a Consultant, Children's Diabetes Nurse Specialist and the Dietitian. As this is a Teaching Hospital, there may be a visiting doctor, nurse or medical student, but you can ask to be seen without them being in the room if you prefer. You can see any member of the Diabetes Team on their own if you would like to discuss something privately, or make a separate appointment to see your Diabetes Nurse or the Dietitian if you need a longer appointment. You will also have the opportunity to be referred to our Psychologist or a Social Worker.

You will have your height, weight, blood pressure and HbA1c measured at each clinic appointment. We will also download your blood glucose meter(s) and pump if you have one. It is very important that you bring all of your meters to clinic so that we can use all the information to help you to manage your diabetes. Once you are familiar with this, you may be able to download your data at home and email it to us before you come to clinic, in order to give us longer to consider it before we see you to discuss any changes which might help you.

Once each year, you will have an Annual Review, which is a bit like an MOT for a car. We will check your injection/cannula sites and your feet, and advise you about keeping them healthy. You will be asked for a urine sample to check your kidneys are working well and you will have a blood test to screen for coeliac disease or thyroid conditions, and to check other blood levels like cholesterol. After the age of 12, you will have retinal screening to make sure the back of your eyes are healthy.

You will always be offered a clinic appointment every 3 months, but we may ask you to come more often if there are difficulties with managing your diabetes, or you need frequent changes of insulin doses whilst you are growing rapidly. You may also have separate appointments with your Diabetes Nurse for things like Continuous Glucose Monitoring or if you want to look at insulin pumps.

If you are unable to attend any of your appointments, please telephone 0113 2064966 or 0113 2065200 to arrange another appointment. We can then give your unwanted slot to somebody else.

Transition

As you become older, we will start to prepare you for becoming more independent and eventually transferring your care to the Young Adult Team. We will make sure that you know how to manage your diabetes, as your parents may have done all this for you if you were very young when you were diagnosed with diabetes.

When you are around 16 years of age, you will be transferred to the Transition Clinic. This is held in the Manny Cussins Centre, Beckett Wing, St James's University Hospital on the first and third Wednesday morning of each month. You will still see members of the Children's Diabetes Team, but it is held at the same time as the Young Adult Clinic which is part of the adult service.

You will meet the staff at the Manny Cussins Centre, including the Receptionist, and Healthcare Assistant. You will have your height, weight, HbA1c and meter/pump downloads as you did in the Children's Clinic.

You will see your consultant, childrens diabetes nurse and dietitian. You will usually see the doctor on your own, before your parents are invited into the room. This is to encourage independence and to allow privacy. You will also have the opportunity to see the nurse or dietitian to discuss any issues in private. Your information is confidential and will not be given to anybody else without your permission, unless you are at risk of harm.

You will be offered an appointment at least every 3 months, but may be asked to come more often. Adolescence is a difficult time and the effects of hormones mean that it is difficult to achieve good control of blood glucose. You will need to increase your insulin doses quite often whilst you are growing rapidly, and may need to decrease them when you stop growing. If you are unable to attend any of your appointments, please telephone 0113 2065066 to arrange another appointment and allow us to use that one for someone else.

It is very important not to start smoking, as the combination of diabetes and smoking leads to an increased risk of heart disease. We can advise people with diabetes who do smoke and refer to Leeds Smoking Cessation Service. We will discuss driving regulations, alcohol, drugs, sex and preconception care with you, and can advise on careers, leaving home etc.

You will be screened for any early signs of complications by having your urine, blood pressure and eyes checked. We do not expect to find any problems, but if any are found, the right treatment can begin straight away. You will have an Annual Review every year like you did before.

Young Adults

Whilst you are attending the Transition Clinic, you will be introduced to the Adult Diabetes Nurse Specialists, the Dietitian and the Consultants. When you are about 19 years old, you will be transferred to their care.

You will attend the Young Adult Clinic, which is held at the same time as the Transition Clinic, and will usually see the Consultant on your own; however, you can bring a friend, relative or partner to clinic with you if you feel more comfortable. You will be asked to have any blood tests taken in the blood room or at your GP surgery a couple of weeks before you come to clinic. You will see the Diabetes Nurses for Young Adults and the Dietitian.

Because you are now an adult, you are responsible for your own diabetes management, although the Young Adult Diabetes Team will help you with this. If you cannot attend an appointment, please telephone 0113 2065066 to rearrange it. This means that you will get another appointment to suit you and we will be able to see someone else. If you don't ring to rearrange and don't turn up for an appointment, you will be discharged from the hospital diabetes service and you will then have to ask your GP to re-refer you for another appointment with the specialist team.

When you reach the age of 25, or sooner if you feel ready, you will be transferred to the general Adult Clinic. This could also mean a change of Consultant, Nurse or clinic day.

G6: When to contact the team

Guide for when to contact the diabetes team so that changes can be made before the next clinic appointment.

The diabetes team is here to help. Please email or contact your nurse if you are not sure what to do next. Always ring the office or emergency numbers (if urgent out of hours). Some ideas about when to contact us are listed:

Hypoglycaemia

- Following a severe hypo
- If there are more hypos than usual or they occur regularly with exercise
- If there is hypo unawareness or night time hypos
- Always contact your team if you have any worries or questions

High Blood glucose levels

- If there is a trend with your blood glucose levels rising into double figures.
- If your weekly average blood glucose level (see meter) is rising above 9.5mmol/l

Variable swinging blood sugars

- If your glucose levels are swinging and you are uncertain what to do.

Use the 'Glucose tracker' facility on the upbete web site and e mail the results to your diabetes specialist nurse.

Make a note of questions you may want to ask:

Section 2: Enhanced learning

Section 2 can be read at home and requires that you have read the first 'essential part' of the work book and have started to manage basic diabetes care. It will help to enhance your understanding of diabetes and food in particular, but also highlights the importance of aiming for good control from the start.

H Learning more about your diabetes

I Problem solving and adjusting insulin

J Practical carbohydrate counting

K Exercise and lifestyle

L Managing glucose extremes

M Protecting your future health

N Useful information

H1: History of Type 1 Diabetes

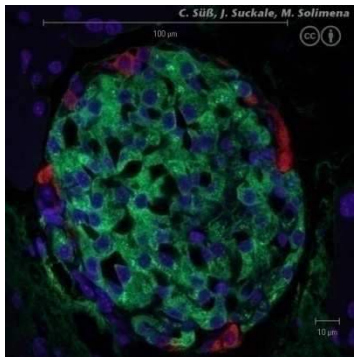
Ebers papyrus

Description of type 1 diabetes: Type 1 diabetes was first thought to have been described in the papyrus manuscripts of ancient Egypt where it was recognised that people could develop an illness associated with loss of weight, passing urine all the time day and night, profound dehydration and the urine tasted very sweet (this was how the condition was diagnosed)-there was no recognised treatment.

The origin of insulin: At the end of the 1800 it was known that diabetes occurred if the pancreas was removed-suggesting that there was 'a chemical' produced in the pancreas which controlled glucose levels in the blood.

Paul Langerhans

Paul Langerhans subsequently described cells seen under the microscope within the pancreas, which later were named 'Islets of Langerhans' and eventually shown to be the source of insulin (see photo).



Islet cells

The term 'insulin' comes from the Latin 'insula' meaning island. At the time the only treatment on offer was a diet containing no carbohydrate, this was unpleasant and of very limited success but it showed that diet, in particular carbohydrates, was important in the management of diabetes.

Isolation of insulin: Several attempts have been made to isolate 'insulin' but all failed until in the early 1920s Banting, a surgeon from Canada, moved to Toronto to work in the laboratory of Prof *Macleod*. Banting had the idea that everyone else had failed because in the insulin extraction process they were destroying the islet cells and therefore destroying the insulin.

Banting was joined by Best who was still a medical student looking for a holiday job and they successfully isolated a crude form of insulin by removing the pancreas from a dog and purifying the

insulin from the islet cells. They then were able to show that they could correct the high glucose levels by injecting it back into the same dog.

Banting

Best

Banting's lab

Treatment using insulin: 'Marjorie' is allegedly the first dog to be successfully treated in this way (see photo).

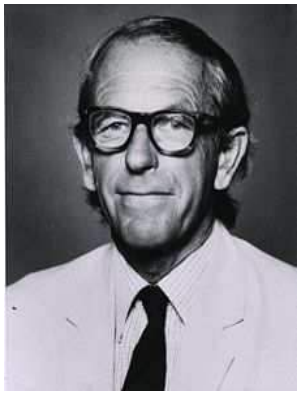
Subsequently, Collip a biochemist joined the team and succeeded in purifying the insulin to a much higher quality.

Banting and *Macleod* were awarded the Nobel Prize (1923) but shared it with Best and Collip.

The first child (Leonard Thompson) was treated in January 1922 with a total of 7 children treated in the first year.

Best, Banting and Marjorie

Commercial development of insulin: Within a year Eli Lilly had started to produce insulin from animal pancreases to purity such that it could be used to treat children and adults, the first commercially available insulin.



Frederick Sanger

Human insulin: Frederick Sanger in Cambridge UK managed to sequence the insulin protein into its basic building blocks or amino acids, leading to the commercial development of human insulin in the laboratory and subsequently its preferential use to animal insulin's for the treatment of diabetes.

This then led to the modification of insulin to improve its function (**analogue insulin's**), Sanger was awarded a Nobel prize for this work.

Glucose meter

Blood glucose testing: Glucose meters were developed from 1962 so that rather than testing urine a blood test using a figure prick and test strip would give an accurate blood glucose reading.

There are lots of different meters and your diabetes team will advice on the best; most enable you to measure your blood glucose very rapidly and to store the results.

Injection of insulin: To inject insulin, glass syringes have been replaced initially by plastic syringes and then more recently by **insulin pens**.

This makes it easier to dial the correct dose and give the injection quickly.

Plastic syringes and pen devices

Importance of good diabetes control: From 1983 to 1993 the Diabetes Control and Complications Trial (DCCT) in America showed conclusively that good control considerably improved the long-term outcome of type 1 diabetes reducing the risk of eye and kidney disease considerably. To obtain good control it required 'intensive insulin therapy' using fast insulin with carbohydrates and a background insulin-**basal bolus regimen.**

Insulin pumps: Over the last 10 years insulin pumps have become one of the mainstays of treatment. This is simply another way of giving insulin but when used properly can be very successful, but not always suitable for everyone. This allows insulin to be given continuously (**basal insulin**) and as a bolus (**bolus insulin**) with carbohydrates. Some pumps can be linked with blood glucose sensors but it is only in the experimental situation at present that they can be used to determine insulin dose.

One of the first insulin pumps (1979)

Roche Pump with handset

Future advances: Since 2000 Dr James Shapiro in Canada has pioneered islet cell transplants to try to cure diabetes. These are still experimental but are showing some success-watch this space.

James Shapiro

Research over the last few years have focused on isolating primitive **stem cells** converting them into islet cells and then injecting them into animals-this shows promise but considerable work needs to be done before this may be applicable to humans.

Key message: Large research projects across the world are attempting to find cures for diabetes with exciting ideas on the horizon.

H2: Diabetes facts and information

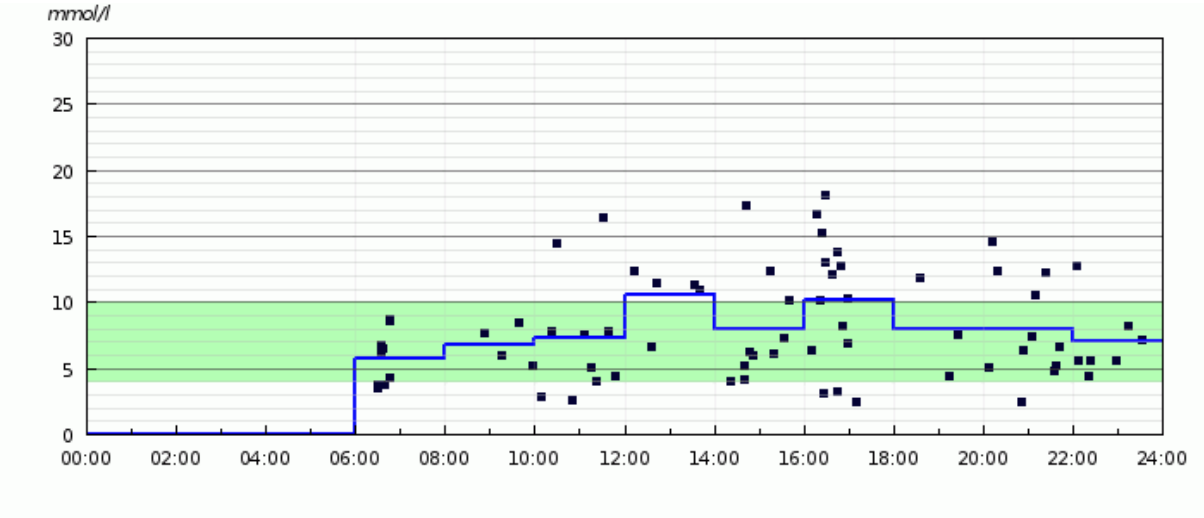
- Type 1 diabetes affects about 350,000 people in the UK and about 26,000 are children.
- Type 1 diabetes is not the same as type 2 diabetes. Type 2 diabetes is usually diagnosed in adults and is associated with lifestyle factors such as increased body weight. This can be controlled initially by careful monitoring, diet and lifestyle changes. Eventually it needs other treatments including tablets and insulin.
- Type 1 diabetes is nobody's fault. It can happen to anyone at any age and is not caused by eating too many sweets.
- Type 1 diabetes can only be treated by insulin injections administered several times a day via a pen device or an insulin pump.
- Children with diabetes can eat the same food as everyone else. Healthy food choices are important for all of us.
- Children with diabetes are allowed sweets and chocolate. For example having them after a meal as a treat. The team will be able to advise how best to enjoy them.
- Children with diabetes are still like other children: they can play, run, go to school and parties just like everyone else.

H3: Average blood glucose levels and meter downloads.

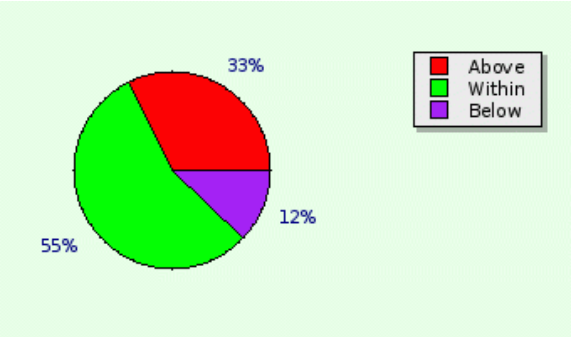
When you attend your diabetes outpatient clinic you should expect that your meter(s) will be downloaded and then the results discussed with you at your consultation. The same will apply to your pumps if you are on a pump. It is therefore essential that all your meters are brought to clinic and that the time and date is correct on the meter. If you wish to obtain a new meter, then please check with the team that it will download.

The Diasend system is used in many hospitals and enables the downloading of several different meters and the results displayed on the same tables and graphs. Some examples are shown below.

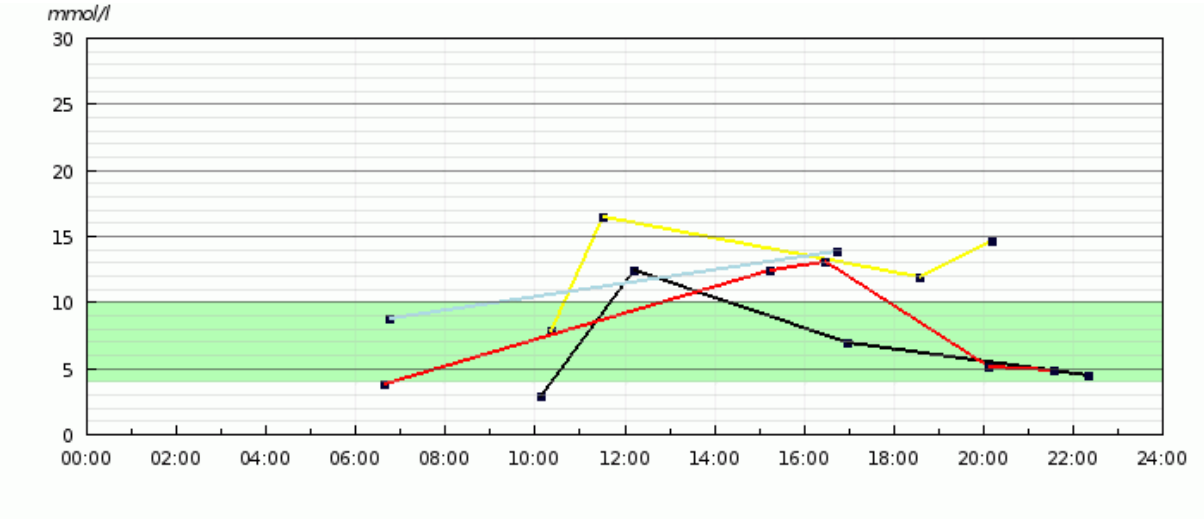
All blood glucose values over the last month plotted against time, with blue line showing mean (average) value. Note cluster of high levels at lunch time and late afternoon.



Summary of results over the last month: To achieve good control you need at least 55 to 60% of your blood glucose levels between 4-10mmol/L and no more than 10% low levels.



Glucose results for each day joined up. Note the rising blood glucose levels after breakfast suggesting that the Insulin carbohydrate ratio may need changing at breakfast and the need to review early morning hypos.



Comparison of results from meter downloads for children with HbA1c less than 58mmol/mol (7.5%) and greater than 80mmol/mol (9.5%). Results were taken over 1 month and at least two blood glucose results had to be recorded every day.

Parameter (HbA1c)	**Less than 58 (7.5%)**	**Greater than 80 (9.5%)**
Average BG	8.7 mmol/l	14.2 mmol/l
Average BG 16.00-18.00 hours	10.0 mmol/l	14.3 mmol/l
Average BG 18.00-20.00 hours	10.0 mmol/l	15.8 mmol/l
Standard Deviation	4.6	6.8
% in normal range	57%	28%
% < 4mmol/l	12%	7%
No of measurements per day	5.3	3.7

H4: HbA1c or glycated haemoglobin

This leaflet is to help you understand what is meant by HbA1c or glycated haemoglobin. This is an indication as to what your blood glucose levels have been over the last few weeks.

What does it measure?

Haemoglobin is present in everyone's red blood cells (the Hb of HbA1c), this is what makes your blood red. Glucose sticks to red cells and the more glucose there is around in the blood, then the more red cells have glucose attached. The average lifespan of a red cell is 120 days and therefore if we measure how many red blood cells have glucose attached to them, it gives us a guide to the glucose levels in your blood over the last 120 days (3 months).

What it does not measure?

This can be the confusing bit. It is not a measure of blood glucose as you would get if you are doing a finger prick and testing your blood with a meter. It does not measure sudden changes in your blood glucose and it will not reflect a single poor day or week.

What are normal levels and how does it relate to your blood glucose?

These can vary a little bit between laboratories but in Leeds, the normal (non diabetic) value is 20-45 mmol/mol (old units are 4.0-6.5%). This means that approximately up to 6 red cells out of every 100 in your blood will have glucose attached.

HbA1c	Normal/abnormal	Average blood glucose
20-47 mmol/mol 4-6.5%	Normal for those without diabetes	3-8mmol/L
48-58 mmol/mol 6.5-7.5%	Target range for those with diabetes	4-10mmol/L
64-75 8-9 %	High	11-14mmol/L
Greater than 75 Greater than 9 %	Very high	15 and above

National guidelines recommend a HbA1c of less than 58 (7.5%). This is very tough and hard work to achieve but worth it. Research has shown that the higher the HbA1c result, the greater the risk of long term complications.

How often is it measured?

We aim to measure HbA1c every time you come to clinic, at least every 3 months. If it is above 75 mmol/mol (9%), we will ask to see you more frequently and you will have your HbA1c measured every time!

See also leaflet on 'meter downloads'.

I1: Insulin adjustment and problem solving

There are some general guidelines to help you to adjust your insulin doses and resolve problems with your blood glucose levels. These guidelines relate to basal bolus regimens where you are giving rapid acting insulin with carbohydrate and long acting insulin once per day. Always review portion size and check your carbohydrate counting is correct for the meal before the abnormal glucose level and ask whether snacks are being eaten without insulin. If this is correct then consider changing the insulin to carbohydrate ratio (e.g. if you want to increase the insulin dose go from 1 unit:10grams to 1 unit:8 grams).

Exercise such as school sports can affect your glucose results (usually decrease glucose levels).

Look to see if there is an association as you may need to give less insulin before such events. It is generally better to get glucose levels right in the morning first and then work through the day.

You should only change insulin doses if there is a trend of three or more high or low blood glucose levels. It is important to only change one of the doses of insulin at a time and to wait for 2-3 days before making any further changes. If the blood glucose levels do not respond as you expected, please ring a member of the Diabetes Team for advice.

Problem	Solution
High blood glucose - Pre **Lunch**	Increase insulin to CHO ratio at breakfast
Low blood glucose - Pre **Lunch**	Decrease insulin to CHO ratio at breakfast
High blood glucose - Pre **Tea**	Increase insulin to CHO ratio at lunch.
Low blood glucose - Pre **Tea**	Decrease insulin to CHO ratio at lunch
High blood glucose - Pre **Bed**	Increase insulin to CHO ratio at tea
Low blood glucose - Pre **Bed**	Decrease insulin to CHO ratio at tea
High blood glucose - Pre **Breakfast**	Discuss with Diabetes team, see if glucose levels are normal before bed and high in the morning then increase long acting insulin by 1 to 2 units. If glucose levels are high before bed then correct these first and then review.
Low blood glucose - Pre **Breakfast**	Decrease long acting insulin by 1 or 2 units
Low blood glucose during night then **High** Pre-**Breakfast**	Decrease long acting insulin by 1 or 2 units (This is known as the **Somogyi effect**)
Hypo - after or during exercise	Reduce insulin before exercise by 1-2 units if exercise is very strenuous.
Blood sugar going up and down – No pattern.	Contact Diabetes Team. Rotate injection sites, check on whether you are having significant hypos and reduce them. Make sure not missing insulin.
Blood sugar high after meals then zooming down low. Hypos with no pattern or reason.	Try changing the injection site and reduce the insulin. Contact the Diabetes Team.

If you are unsure, please do not hesitate to ask for help.

If you have 2 or 3 injections each day, please discuss with your Diabetes Team. If you are uncertain about your accuracy of the insulin to carbohydrate ratio consider doing a test meal (**see Carbohydrate test meal**).

I2: Frequently Asked Questions

In this section we have tried to address frequently asked questions such as:

- What to do if you are low at certain times of the day
- What to do if you are high
- What to do if you have missed your insulin
- What to do if you have given the wrong insulin
- What to do if you have given the wrong amount

These guidelines relate to basal bolus regimens were you are giving fast acting insulin with carbohydrates and long acting insulin as a background.

It is important to remember **Don't Panic!**

Mistakes happen to everyone at sometime.

The important thing is to correct the action to minimise hypoglycaemia or hyperglycaemia and ketones.

What to do if your blood glucose is high

Q	Is your blood glucose level above 8mmol/L on most mornings before food?
A	Yes. • First check a blood glucose level around 2-3am to ensure you are not going low overnight. • Make sure you are going to bed with a normal glucose level and check to see that if you have a normal glucose level at bedtime that your glucose level is normal in the morning.. • If your bedtime glucose is normal but you are high during the night then increase your Long acting Insulin by 0.5-1unit if taken at night. Wait 2-3days and repeat if still above 8mmol/L. • If your bedtime glucose levels are high at bedtime which then makes them high in the morning you need to work on getting your bedtime glucose levels normal?
A	No. Leave your Long Acting dose the same.
Q	Is your blood glucose level above 8mmol/l before lunch on most days?
A	Yes. If you do not eat a snack mid-morning, consider increasing your meal ratio with breakfast. If you have a mid-morning snack you may need extra insulin with this, or consider omitting snack or carb free snack or limit carb amount. If unsure what to do discuss with your diabetes nurse.
A	No. Keep your ratio with breakfast the same.
Q	Is your blood glucose level above 8mmol/l before tea on most days?
A	Yes. If you do not have a snack mid-afternoon, consider increasing your meal ratio with lunch. If you have a snack mid-afternoon you may need insulin with this, or consider omitting snack or carb free snack or limit carb amount. If unsure what to do discuss with your diabetes nurse.
A	No. Keep ratio with lunch the same.
Q	Is your blood glucose level above 8mmol/L before bed on most days?
A	Yes. Consider increasing meal ratio with tea if no other snack has been eaten.
A	No. Keep ratio with tea the same.
Q	Have you eaten anything and forgotten to give Insulin?
A	Yes. Give Rapid Acting Insulin now for carbohydrates eaten.
A	No or not sure. Recheck blood glucose in 60 mins and give correction if necessary. Use your Insulin Sensitivity Factor to work this out. See ISF chart. Or call diabetes team for advice.
Q	Have you given insulin in the last 90 mins?
A	Yes. Do nothing and recheck blood glucose in 60 mins.
A	No. Give a correction dose using Rapid Acting Insulin. Or you could wait until the next meal to give a correction if answer to next question is no.
Q	Do you have blood ketones over 0.6mmol/L?
A	Yes. Give a correction dose of Rapid Acting Insulin now. (unless you have given insulin in the last 90mins, then recheck blood glucose and ketones in 60 mins)

A	No. Add a correction dose of Rapid Acting Insulin to next meal.

What to do if your blood glucose is Low

Q	Is your blood glucose level below 5.0mmol/L on most mornings before food?
A	Yes. Reduce your Long Acting Insulin by 0.5-1unit if taken at night. Wait 2-3 days and repeat if still 3.9mmol/l or below.
A	No. Leave your Long Acting dose the same.
Q	Is your blood glucose level below 5.0mmol/L before lunch on most days?
A	Yes. Decrease your meal ratio with breakfast. Alternatively, consider giving small snack mid-morning without insulin. If unsure what to do discuss with your diabetes nurse.
A	No. Keep your ratio with breakfast the same.
Q	Is your blood glucose level below 5.0mmol/L before tea on most days?
A	Yes. Decrease your meal ratio with lunch. Alternatively, consider having small snack mid-afternoon without insulin. If unsure what to do discuss with your diabetes nurse.
A	No. Keep ratio with lunch the same.
Q	Is your blood glucose level below 5.0mmol/L before bed on most days?
A	Yes. Consider decreasing meal ratio with tea.
A	No. Keep ratio with tea the same.
Q	Are you low following exercise/activity?
A	Yes. Consider having extra carbohydrates before, during or after. Alternatively consider giving less insulin with your meal if exercise is within 2 hours.
A	No or not sure. Discuss with your diabetes nurse or dietitian for further advice.
Q	Have you given a correction dose within the last 2 hours?
A	Yes. Consider adjusting your correction dose to give less insulin. If you are unsure how to do this discuss with diabetes nurse.
A	No or not sure. Ring to discuss

What to do if you have forgotten to take your long acting insulin

Q	Do you normally take your long acting insulin at night?
A	Yes. Take half usual dose in the morning and take full dose in the evening. Test blood glucose more frequently and if more than 10mmol/l correct at meal times with fast acting insulin. Test blood glucose overnight between 2-3am to ensure you are not hypoglycaemic.
A	No. See next question.
Q	Do you normally have your long acting insulin in the morning?
A	Yes. If you remember your missed dose **before mid-day** take your **Normal** dose immediately.
A	Yes. If you remember your missed dose **after mid-day**, take **Half** your normal dose of long acting insulin and then give your normal dose the following morning. Test your blood glucose levels more frequently. Correct at meal times with fast acting insulin. Check blood glucose level between 2-3am to ensure you are not hyperglycaemic (too high). If blood glucose levels are over 14mmol/Lwith ketones greater than 0.6mmol/L give a correction dose using fast acting insulin. Use your Insulin Sensitivity Factor (ISF) see chart.

What to do if you have forgotten to take your rapid Acting insulin

Q	Is it within 30mins of eating?
A	Yes. Give fast acting insulin for carbohydrates eaten.
A	No or not sure. Check blood glucose levels now. If over 14mmol/l check for ketones. If ketones greater than 0.6mmol/l give a correction dose now using fast acting insulin. Use your Insulin Sensitivity Factor (ISF) see chart, or contact diabetes team for further advice.

What to do if you have given the wrong insulin

Q	Have you given **Fast Acting Insulin** instead of **Long Acting Insulin**?
A	Yes. Check your blood glucose levels 1 hourly for the next 4 hours and give extra food containing carbohydrates (without insulin). Treat hypoglycaemia with fast acting glucose. Call the diabetes team for further advice.
Q	Have you given **Long Acting Insulin** instead of **Rapid Acting Insulin**?
A	Yes. Call the diabetes team for advice.

Carbohydrate Counting Reference Tables

Carbohydrate Counting

Carbohydrate counting means calculating the amount of carbohydrate (carbs) you are eating, so that you can give a matching insulin dose, to help control blood glucose levels. The amount of insulin needed varies between different people and the diabetes team will advise you on how much you need. The dose may vary between meals, depending on what you are eating, and is for rapid acting insulin e.g. Novorapid, Humalog or Apidra.

This booklet will help you work out how much carbohydrate is in the food that you eat, and is counted in grams. Carbohydrate foods have the greatest effect on blood glucose. Protein foods, most vegetables and fats have less immediate effects on blood glucose and are not included in insulin calculations. Protein foods and vegetables are important for other nutrients and should be eaten regularly.

How To Calculate The Carbohydrate Content Of Your Food

The tables tell you how much carbohydrate is in a described portion of food, but also how much is in a 100g portion. If you are weighing your food, this number is useful to calculate your portion. Weighing food is the most accurate way of calculating carbohydrate content of food without labels

$$\frac{\text{The amount of carbohydrate in 100g of food}}{100} \times \text{Your portion weighed on scales in} = \text{Grams of carbs in your portion}$$

Example for cornflakes

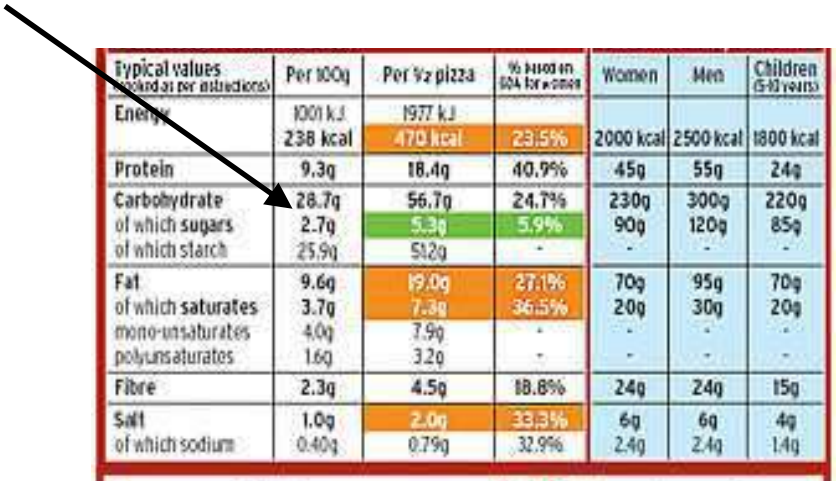
$$\frac{85g}{100} \times \text{My portion } 45g = 38g$$

Remember: the actual weight of a food measured on scales, is NOT the same as the amount of carbohydrate that food contains.

You can also use the calculator grid on the last page to work this out.

Reading Labels

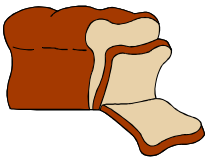
When reading nutritional labels, you need to use the 'total carbohydrate' value not the 'of which sugars'. This may be per portion or per 100g. The total carbohydrate includes starches and sugars.



Typical values (as sold or per instructions)	Per 100g	Per ½ pizza	% based on GDA for a woman	Women	Men	Children (5-10 years)
Energy	1001 kJ 238 kcal	1977 kJ 470 kcal	23.5%	2000 kcal	2500 kcal	1800 kcal
Protein	9.3g	18.4g	40.9%	45g	55g	24g
Carbohydrate	28.7g	56.7g	24.7%	230g	300g	220g
of which sugars	2.7g	5.3g	5.9%	90g	120g	85g
of which starch	25.9g	51.2g	-	-	-	-
Fat	9.6g	19.0g	27.1%	70g	95g	70g
of which saturates	3.7g	7.3g	36.5%	20g	30g	20g
mono-unsaturates	4.0g	7.9g	-	-	-	-
polyunsaturates	1.6g	3.2g	-	-	-	-
Fibre	2.3g	4.5g	18.8%	24g	24g	15g
Salt	1.0g	2.0g	33.3%	6g	6g	4g
of which sodium	0.40g	0.79g	32.9%	2.4g	2.4g	1.4g

Bread





Food Item	Typical Portion Size	Carbs Per Portion	Carbs Per 100g
Bagel	1 bagel (85g)	49	58
Bread Muffin	1 toasted (70g)	36	51
Bread, white	1 thick slice large loaf (45g)	20	45
	1 medium slice large loaf (33g)	15	45
	1 thin slice small loaf (25g)	11	45
Bread, wholemeal	1 thick slice large loaf (45g)	19	42
	1 medium slice large loaf (30g)	13	42
	1 thin slice small loaf (25g)	10	42
Breadcake, white/wholemeal	1 6 inch diameter (112g)	56	50
Bread Roll, soft, white/wholemeal	1 roll (48g)	24	50
Chapati	1 medium (55g)	25	44
Ciabatta Roll	1 roll (97g)	50	51
Crackerbread	2 slices (11g)	8	77
Croissant	1 standard (57g)	24	43
Crumpet	1 toasted (40g)	17	43
Finger Roll	1 roll (40g)	20	50
French Stick	2 inch/5cm slice (40g)	22	55
	6 inch/15cm slice (120g)	66	55
Granary Bread	1 medium slice (35g)	16	46

Naan Bread	1 large (160g)	80	50
Panini	1 panini (90g)	40	45
Pitta Bread	1 standard (75g)	41	55
	1 mini (35g)	19	55
Rye Bread	1 average slice (25g)	11	46
Toasted Teacake	1 teacake (85g)	49	58
Tortillas, wheat	1 medium (40g)	23	58
Waffle	1 sweet waffle (38g)	20	52

For uncut bread - weigh a slice and calculate using 45g carbohydrate per 100g

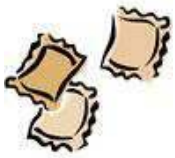
Breakfast Cereals

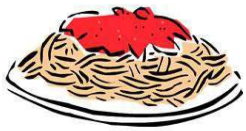

Food Item	Typical Portion Size	Carbs Per Portion	Carbs Per 100g
All Bran	6 tablespoons (42g)	20	48
Bran Flakes	7 tablespoons (42g)	28	67
Cheerios	7 tablespoons (28g)	21	75
Cocopops	7 tablespoons (28g)	24	84
Cornflakes	7 tablespoons (42g)	36	85
Fruit 'n' Fibre	7 tablespoons (42g)	29	69
Muesli, no added sugar	2 tablespoons (30g)	20	67
Oatibix	1 biscuit (25g)	16	64
Oatibix Flakes	7 tablespoons (42g)	31	73
Oatso Simple Original	27g serving inc 180ml milk	27	69 (dry)
Porridge/Rolled Oats	2 tablespoons - dry (30g)	19	62

Ready Brek	30g serving inc 180ml milk	27	59 (dry)
Rice Krispies	7 tablespoons (28g)	24	87
Shredded Wheat	1 biscuit (22g)	15	68
Shreddies	5 tablespoons (35g)	26	74
Special K Original	7 tablespoons (28g)	21	76
Weetabix	1 biscuit (19g)	13	68
Weetabix Minis, Choc Chip	1 portion (40g)	28	71
Weetabix Minis, Honey Nut	1 portion (40g)	29	72
Weetos Meteors	5 tablespoons (30g)	23	76

Rice, Pasta, Grains and Sauces







Food Item	Typical Portion Size	Carbs Per Portion	Carbs Per 100g
Couscous	1 average portion (150g)	35	23
Cooked weight	1 heaped tablespoon (33g)	8	23
Dumpling	1 average (70g)	18	25
Egg Noodles	1 layer - dry (70g)	49	70
Fresh Pasta	1 medium portion (230g)	69	30
Lasagne, home made	1 average portion (420g)	63	15
Lasagne, ready meal	1 individual (290g)	44	15
Lasagne Sheet	1 sheet - dried	10	68
Macaroni Cheese	1 small tin (200g)	36	18
Pasta, white/wholemeal,	Small average portion (150g)	33	22
Any shape	Medium average portion (230g)	50	22

Cooked weight	Large average portion (350g)	77	22
	1 heaped tablespoon (30g)	7	22
Pasta in Sauce (packet)	½ packet made up	44	68 (dry)
Rice, white/brown/basmati Cooked weight	Small average portion (100g)	30	30
	Medium average portion (180g)	54	30
	Large average portion (290g)	87	30
	1 heaped tablespoon (40g)	12	30
Tinned Spaghetti	1 small tin (215g)	28	13
Tinned Ravioli	1 small tin (215g)	28	13
Tortellini, cooked	1 portion (180g)	47	26
Yorkshire Pudding, home made	2 small puddings (80g)	20	25
Yorkshire Pudding, ready made	2 small puddings (40g)	19	47
Sauces			
Sweet and Sour Sauce	1 jar (500g)	85	17
Sweet and Sour Sauce Light	1 jar (500g)	50	10
Tomato Pasta Sauce	1 jar (500g)	45	9

Dairy and Desserts




Food Item	Typical Portion Size	Carbs Per Portion	Carbs Per 100g
Cheesecake	1 slice (100g)	33	33
Choc Ice	1 chunky (45g)	14	31

Chocolate Mousse	1 pot (55g)	14	25
Chocolate Mousse, light	1 pot (55g)	8	14
Custard Powder/Cornflour	1 tablespoon (25g)	23	92
Custard, low fat, tinned	½ large can (210g)	34	16
Dried Skimmed Milk Powder	2 tablespoons (30g)	16	53
Evaporated Milk	100mls	8	8
Fresh Milk, skimmed/semi-skimmed/full fat	1 glass (200mls or 1/3 pint)	10	5
Fromage Frais	1 small pot, each (60g)	8	13
Frubes	1 tube (40g)	6	15
Ice Cream, vanilla/chocolate/strawberry	1 scoop/briquette (60g)	13	21
Meringue Nest	1 small (15g)	14	96
Mini Milk Ice Cream Lolly	1 lolly (23g)	5	21
Profiteroles	2 with chocolate sauce (40g)	10	25
Rice Pudding, tinned	½ large can (210g)	34	16
Rice Pudding	1 rice pudding pot (190g)	35	18
Yogurt, corner	1 Fruit Corner (175g)	23	13
	1 Crunch Corner (150g)	29	19
Yogurt, diet e.g. Shape,	1 small carton (125g)	10	8
Weight Watchers, Muller Light	1 tub (200g)	15	8
Yogurt Drink	1 probiotic type (100ml)	13	13
	1 Yop Mini (180ml)	25	14
Yogurt, low fat fruit	1 small carton (125g)	20	14
Yogurt, natural	1 small carton (125g)	10	8

Fruit

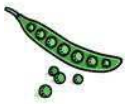




Food Item	Typical Portion Size	Carbs Per Portion	Carbs Per 100g
Apple, eating	1 medium (112g)	13	12
	1 large (170g)	20	12
Apple Juice, unsweetened	1 small glass (100ml)	11	11
	1 tall glass (250ml)	28	11
Apricots, fresh	3 whole (120g)	8	7
Apricots, dried	3 ready to eat (24g)	9	37
Banana, weighed without skin	1 small (80g)	18	23
	1 medium (100g)	23	23
	1 large (120g)	28	23
Blueberries	1 portion (100g)	15	15
Cherries	12 cherries (50g)	5	9
Dates	2 dried, without stone (30g)	20	68
Dessert Plum	2 large (170g)	15	9
Fruit Cocktail, tinned in juice	1 average portion (100g)	15	15
Fruit Salad	Fresh, average portion (140g)	21	15
Grapefruit	½ grapefruit, flesh only (80g)	6	7
Grapefruit, tinned in juice	1 average portion (140g)	10	9
Grapefruit Juice, unsweetened	1 small glass (100mls)	10	10
Grapes	12 medium (70g)	10	15
Kiwi	1 fruit (60g)	6	10
Mandarins, tinned in juice	½ small tin (150g)	23	15
Mango	1 slice (40g)	6	14
	1 whole, flesh, no skin (150g)	21	14
Melon	Cantaloupe, 1 slice (200g)	10	5
	Honeydew, 1 slice (200g)	12	6
	Watermelon, 1 slice (200g)	14	7
Nectarine	1 medium (150g)	12	8
Orange	1 medium, flesh (160g)	12	8
	1 large, flesh (210g)	17	8
Orange Juice, unsweetened	1 small glass (100ml)	10	10
	1 tall glass (250ml)	25	10
Peach	1 medium (150g)	10	7
Peaches, tinned in juice	1/3 small tin (100g)	9	9
Pear	1 medium (150g)	15	10
Pears, tinned in juice	½ pear (60g)	5	9
Pineapple	1 slice fresh (80g)	8	10
Pineapple, tinned in juice	1 ring/6 chunks (40g)	5	12
Prunes	3 dried (24g)	8	34
Raisins	1 tablespoon (30g)	21	69

	1 small box (14g)	10	69
Raspberries	20 raspberries (100g)	6	6
Satsumas	2 medium (140g)	13	9
Strawberries	10 strawberries (100g)	6	6

Vegetables





Food Item	Typical Portion Size	Carbs Per Portion	Carbs Per 100g
Baked Beans	2 tablespoons (80g)	12	15
Baked Potato with Skin	1 medium (180g)	58	32
Baked Potato without Skin	1 medium (180g)	32	18
Butter Beans	1 small tin (200g)	28	14
Butternut Squash, cooked	2 heaped tablespoons (100g)	11	11
Chick Peas, tinned	3 tablespoons (90g)	14	16
Chips	5 medium chips (35g)	11	30
Dhal, cooked	2 tablespoons (100g)	15	15
French Fries	10 fries (25g)	9	35
Frozen Peas, boiled	2 tablespoons (60g)	6	10
Hummus	2 tablespoons (60g)	8	13
Mashed Potato	1 scoop (60g)	9	15
	2 tablespoons (90g)	14	15
Mushy Peas	1 average portion (125g)	19	15
New Potatoes with Skin, boiled	1 average (40g)	6	15
Parsnip, baked	1 whole (60g)	13	22
Plantain, fried	3 thick slices (42g)	20	47
Potatoes, boiled	1 average (60g)	9	15
Potato Croquette	1 baked (80g)	16	20
Potato Salad	1 small carton (180g)	20	11
Potato Waffle	1 waffle (45g)	14	30
Potato Wedges	2 large (30g)	8	25
Red Kidney Beans	1 small tin (200g)	36	18
Red Split Lentils, cooked	3 tablespoons (120g)	20	17
Roast Potato	1 small (50g)	13	26
Sweet Potato, boiled	1 medium (65g)	13	20
Sweetcorn, canned	2 tablespoons (60g)	15	25
Yam, boiled	1 thick slice (60g)	20	33

Meat and Fish Products





Food Item	Typical Portion Size	Carbs Per Portion	Carbs Per 100g
Breaded Chicken/Chicken Kiev	1 individual (170g)	15	9
Breaded Fish	1 fillet (150g)	23	15
Cheese and Onion Pasty	1 individual (150g)	35	23
Chicken Nuggets	6 nuggets (100g)	11	11
Cornish Pasty	1 individual pasty (160g)	50	31
Dumplings	1 dumpling (70g)	18	25
Fish Cake	1 fishcake (50g)	8	16
Fish Fingers	2 fish fingers (60g)	9	15
Fish in Sauce, boil in bag	1 portion (170g)	5	3
Pizza, cheese and tomato	½ 12 inch thin crust (150g)	53	35
Pork Pie	1 to share (320g)	80	25
Pork Pie	1 individual (120g)	30	25
Sausage Roll	1 small (35g)	13	35
	1 medium (70g)	25	35
	3 cocktail sausage rolls (42g)	15	35
Steak and Kidney Pie	1 individual (200g)	50	25
Stuffing	1 ball (30g)	9	30
Thick Sausages	2 sausages (110g)	11	10
Yorkshire Pudding, home made	2 small (80g)	20	25

Buns and Cakes





Food Item	Typical Portion Size	Carbs Per Portion	Carbs Per 100g
Choc Chip Muffin	1 standard (105g)	55	52
Chocolate Brownie	1 brownie (80g)	44	55
Chocolate Eclair	1 éclair (56g)	15	27
Cup Cake	1 with icing (56g)	40	71
Fairy Cake	1 bun (35g)	18	52
Flapjack	1 small square (60g)	37	62
Madeira Cake	1 slice (60g)	31	52
Malt Loaf	1 slice (35g)	23	65
Scone, fruit	1 scone (48g)	25	53
Swiss Roll	1 slice (35g)	20	57

Snacks


Food Item	Typical Portion Size	Carbs Per Portion	Carbs Per 100g
Bombay Mix	1 portion (50g)	18	35
Butterkist Toffee Popcorn	1 bag (50g)	40	79
Butterkist Cinema Sweet Popcorn	1 sachet unpopped (100g)	59	59
Butterkist Lite Popcorn	1 sachet unpopped (100g)	49	49
Cashew Nuts, roasted	1 portion (50g)	10	19
Crisps, individual pack	1 packet (34g)	17	50
Crisps, multipack	1 small packet (25g)	12	50
Doritos	1 bag (55g)	34	62
Dried Fruit and Nuts	1 small packet (30g)	11	37
Mini Cheddars	1 bag (25g)	13	51
Peanuts/Pecans/Pistachios	1 packet (50g)	4	7
Popcorn, popped, plain or salted	1 level teacup (20g)	10	48

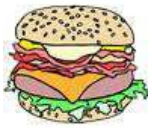
Pretzels	1 bag (50g)	35	70
Pringles	1 short tube (50g)	24	47
Quavers	1 individual bag (20g)	10	62
Raisins	1 portion (30g)	27	69
Tortilla Chips	1 portion (50g)	30	60
Twiglets	1 packet (25g)	16	62
Wotsits	1 individual bag (20g)	12	60


Biscuits and Cereal Bars


Food Item	Typical Portion Size	Carbs Per Portion	Carbs Per 100g
Alpen Light Bar	1 bar (21g)	12	56
Cream Crackers	2 crackers (14g)	9	67
Crispbreads, rye	2 crispbreads e.g. Ryvita (20g)	13	67
Digestive Biscuit	1 biscuit (15g)	10	66
Flapjack	1 small square (60g)	37	62
Fruesli Bar	1 bar (30g)	19	64
Full Chocolate Coated Biscuit	1 biscuit e.g. Penguin (25g)	15	60
Garibaldi Biscuits	2 biscuits (20g)	14	70
Gingernuts	2 biscuits (20g)	16	80
Harvest Chewee	1 bar (22g)	15	70
Jaffa Cake	2 (26g)	20	77
Malted Milk	2 biscuits (15g)	10	66
Muesli Bar, Jordans	1 bar (46g)	26	56
Nature Valley Granola Bar	2 x 21g bar (42g)	28	66
Nutrigrain Bar	1 Elevenses/Oatbake/Softbake	25	65
Oatcakes	1 (13g)	8	63
Pink Wafer	2 biscuit (16g)	10	63
Plain Biscuit	2 biscuits e.g Rich Tea (14g)	10	75
Rice Cakes	1 large thin (8g)	6	80
Rice Krispies Cereal Bar	1 bar (22g)	15	72
Special K Bar	1 bar (23g)	18	77
Weetabix Oaty	1 bar (23g)	12	52

Takeaway Foods



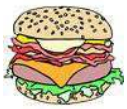


Food Item	Typical Portion Size	Carbs Per Portion	Carbs Per 100g
Chinese			
Chicken/Pork in Batter	Each ball (38g)	8	20
	½ portion - 4 balls (140g)	28	20
Crispy Duck Pancake	1 pancake with duck and sauce (50g)	5	10
Beef/Chicken Chow Mein	½ foil tray (275g)	40	15
Plain Noodles/Chow Mein	½ tray (170g)	60	35
Rice, boiled	½ foil tray (175g)	53	30
Rice, egg fried	½ foil tray (175g)	44	25
Spring Roll	1 large (70g)	14	20
Sweet and Sour Sauce	1 takeaway carton (40g)	9	23
Fish and Chips			
Battered Cod/Haddock	1 average (180g)	25	14
Battered Sausage	1 average (137g)	30	22
Chips	1 small portion (130g)	43	33
	1 medium portion (180g)	60	33
	1 large portion (240g)	80	33
Indian			
Chapati	1 average (50g)	24	48
Naan	½ large (80g)	40	50
Onion Bhaji	1 large (66g)	15	22
Poppadom	1 large (28g)	7	28
Samosa	1 meat (70g)	13	19
***KFC* (www.kfc.co.uk)**			
BBQ Beans	1 regular portion	20	
	1 large portion	50	
Chicken Fillet Burger	1 burger	45	
Coleslaw	1 regular portion	7	

	1 large portion	15	
Original Recipe Chicken	Per piece	10	
Fries	1 regular portion	35	
	1 large portion	50	
Gravy	1 regular portion	8	
	1 large portion	17	
Popcorn Chicken	1 regular portion	15	
	1 large portion	25	
Tower Burger	1 burger	60	

Takeaway Foods, Continued…





Food Item	Typical Portion Size	Carbs Per Portion	Carbs Per 100g
Subway **(www.subway.co.uk)**			
6 Inch Subs	Bread only	40	
Cookies	1 cookie	25 - 30	
Doughnuts	1 doughnut	20	
Muffins	1 muffin	40 - 45	
Sauces	On 6 inch sub	10	
Wraps	1 wrap	60	
Burger King **(www.burgerking.co.uk)**			
Angus Burger	1 burger	45	
BK Fusions	1 ice cream	55	
BK Veggie Beanburger	1 burger	85	
Cheese Burger	1 burger	30	

Chicken Royale	1 burger	55	
Fries	1 small portion	28	
	1 regular portion	43	
	1 large portion	54	
Ocean Catch	1 fish	45	
Onion Rings	1 regular portion	54	
	1 large portion	82	
Whopper	1, with and without cheese	50	
Whopper Junior	1, with and without cheese	30	
McDonalds **(look on reverse side of tray paper)** **(www.mcdonalds.co.uk)**			
Big Mac	1 burger	40	
Cheeseburger	1 burger	30	
Chicken Nuggets	6 nuggets	20	
Chicken Selects	3 pieces	25	
Fillet 'o' Fish	1 fillet	35	
Fries	1 small portion	30	
	1 regular portion	42	
	1 large portion	60	
Hamburger	1 burger	30	
McFlurry	1 ice cream	50 - 60	
Milkshake	1 small	35	
	1 medium	70	
	1 large	90	
Starbucks **(www.starbucks.co.uk)**			
Caffe Latte	1 Tall (smallest size)	14	
Caffe Mocha	1 Tall (smallest size)	33	
Cappuccino	1 Tall (smallest size)	9	

Hot Chocolate	1 Tall (smallest size)	45	
Frappucino Coffee	1 Tall (smallest size)	37	
Frappucino Mocha	1 Tall (smallest size)	43	
Frappucino White Chocolate Mocha	1 Tall (smallest size)	49	
White Chocolate Mocha	1 Tall (smallest size)	47	

Carbohydrate Calculator (see below)

E.g In 100g of Cornflakes, is 85g of carbohydrate

My portion of cornflakes weighs 45g

Read 45 on the green side and 85 on the pink side, gives a carbohydrate content of 38g in my portion.

Paediatric Diabetes Dietitian - Frances Robson

Produced - April 2011

Review date April 2014

Weight of food g																				
200	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
175	9	17	26	35	44	52	61	70	79	87	96	105	114	122	131	140	149	157	166	175
150	7	15	22	30	37	45	52	60	67	75	82	90	97	105	112	120	127	135	142	150
140	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140
130	6	13	19	26	32	39	45	52	58	65	71	78	84	91	97	104	110	117	123	130
120	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
110	5	11	16	22	27	33	38	44	49	55	60	66	71	77	82	88	93	99	104	110
100	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
95	5	10	14	19	24	29	33	38	43	48	52	57	62	67	71	76	81	86	90	95
90	5	9	14	18	23	27	32	36	41	45	50	54	59	63	68	72	77	81	86	90
85	4	9	13	17	21	26	30	34	38	43	47	51	55	60	64	68	72	77	81	85
80	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
75	4	8	11	15	19	23	26	30	34	38	41	45	49	53	56	60	64	68	71	75
70	4	7	11	14	18	21	25	28	32	35	39	42	46	49	53	56	60	63	67	70
65	3	7	10	13	16	20	23	26	29	33	36	39	42	46	49	52	55	59	62	65
60	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
55	3	6	8	11	14	17	19	22	25	28	30	33	36	39	41	44	47	50	52	55
50	3	5	8	10	13	15	18	20	23	25	28	30	33	35	38	40	43	45	48	50
45	2	5	7	9	11	14	16	18	20	23	25	27	29	32	34	36	38	41	43	45
40	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
35	2	4	5	7	9	11	12	14	16	18	19	21	23	25	26	28	30	32	33	35
30	2	3	5	6	8	9	11	12	14	15	17	18	20	21	23	24	26	27	29	30
25	1	3	4	5	6	8	9	10	11	13	14	15	16	18	19	20	21	23	24	25
20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
15	1	2	2	3	4	5	5	6	7	8	8	9	10	11	11	12	13	14	14	15
10	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10
5	*	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5
0	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**

Carbohydrate content per 100g of food

J2: Carbohydrate Test Meals

How to test your insulin carbohydrate ratio

If you are on multiple insulin injections or the insulin pump you will need to calculate how much insulin you have to give with your meal for every 10g of carbohydrate you eat. This can vary from 0.5 units of insulin per 10g of carbohydrate to as much as 2.5 units per 10g of carbohydrate in teenage boys.

When you start on multiple insulin injections or the pump, you should be given a ratio by the Diabetes Team but this will change as you grow and needs to be reviewed every few months.

Below are the instructions on how to test insulin carbohydrate ratio

1. Test your blood glucose before a meal (do not give correction doses)
2. Give insulin based on current ratio (normal bolus)
3. Eat the test meal (see below for examples) with the amount of insulin you normally use
4. Do not eat or drink anything else for 4 hours (you can have water to drink)
5. After 2 hours, test your blood glucose again if you are using the correct ratio your blood glucose should be within 2-3mmol of the before meal level. If your blood glucose is higher, you need more insulin per 10g carbohydrate
6. After 4 hours, check your blood glucose again and it should be the same as the before meal level.

Examples of test meals

Test meals need to have an easy calculated amount of carbohydrate that works quite quickly e.g.

Test meal 1

- 2 Weetabix and 200ml (1/3 pint) of milk = 36g carbohydrate

Test meal 2

- 2 medium slices of toast and 100ml of fresh orange juice = 30g + 10g = 40g carbohydrate

Test meal 3

- sandwich as 2 slices medium bread or packet sandwich with label + muller light yogurt = 30g + 17g carbohydrate

Test meal 4

- medium jacket potato with cheese = 50g carbohydrate

Calculate the insulin

	1 unit per 20g	1 unit per 10g	1 units per 7g	1 units per 5g
Test meal 1 (30g)	1.5 units	3 units	4.5 units	6 units
Test meal 2 (40g)	2 units	4 units	6 units	8 units
Test meal 3 (47g*)	2.5 units	5 units	7 units	10 units
Test meal 4 (50g)	2.5 units	5 units	7 units	10 units

* You must round up or down to the nearest 10g
(If you are unable to give 1/2 units of insulin, either wind up or wind down the dose of insulin)

Example of a test meal

- Blood glucose before eating 9mmol/L
- Normal ratio is 1 unit per 10g of carbohydrate
- A meal is 30g therefore 3 units of insulin given before meal
- Blood glucose 2 hours after eating 15mmol/L
- Blood glucose 4 hours after eating 13mmol/L

Conclusion

1 unit per 10g is not enough insulin. Try increasing it up to 1 unit per 7g and repeat test meal.

It is important to note that sometimes the ratio varies dependent on the meal, quite often breakfast needs a higher ratio than other meals and the fine tuning can only be done by checking blood glucose before and after individual meals.

J3: Snack Attack

These are some suggestions for snacks that you may need between meals. Snacks might be for activity, or because you are hungry, or to stop you from going 'low' or 'hypo'.

Some people need insulin with snacks, especially snacks that contain carbohydrate. Discuss with the nurses whether you need insulin or not. Snacks may have lots of fat even if they are low in carbohydrate, so try and eat a variety of snacks including some healthy ones.

SNACKS CONTAINING 10G (or less) CARBOHYDRATE

Small pear, apple,orange (each)	10
Plum, kiwi, Satsuma (each)	5
Rich Tea, Malted Milk, Sports, Morning Coffee biscuits (2)	10
Digestive, Hob Nob, Ginger Nut biscuits (1)	10
Muller Light yogurt (small, 100g)	8
Fromage frais (1 small)	7
Frube (each)	6
Box of raisins (small)	10
Dried apricots (small handful)	10
Cream Crackers (2)	10
Breadsticks (3)	10
Rice Cakes (each)	3
Ryvita Crispbread (each)	5
French fries, Wotsits, Quavers, Skips (small bag)	10
Cereal Bar (Alpen Light, Special K)	7-10
Glass of milk	10
Highlights/Options hot chocolate powder	5
Oatcakes (each)	5
Strawberries (10)	5

SNACKS CONTAINING NO CARBOHYDRATE

No fat	Contain 'good' fat	Contain 'bad' fat
Pickled onions	Nuts - peanuts	Cheese
Cherry tomatoes	cashews, almonds,	Cheese strings
Cucumber sticks	pistachios, walnuts	Mini Babybel
Carrot sticks	Olives	Peperami
Raw peppers		Mini cocktail sausages
Cold meats - ham,chicken		
Seeds - sunflower,pumpkin		
Cottage cheese		
Sugar free jelly		
Sugar free ice pops		
Diet/zero drinks		

These snacks do not need insulin. They can be eaten alone or with snacks containing a little carbohydrate

J4: The Glycaemic Index

Carbohydrate containing foods are all digested by the body and release glucose into the bloodstream at different rates.

This is due to many different things (e.g. the amount of carbohydrate in the food, its fat, fibre and protein content, how it is cooked and portion size).

Carbohydrate foods that are digested slowly and release glucose into the blood gradually are described as **Low Glycaemic Index** foods- **LOW is SLOW**

Carbohydrate foods that are digested rapidly and release glucose quickly into the blood are described as **High Glycaemic Index** foods.

Studies in adults have shown that diets based on low glycaemic foods can improve blood glucose control.

How do I include low Glycaemic Index foods?

Cereals
Choose oat based breakfast cereals (e.g. porridge, Ready Brek, Oat Bran Flakes, Oat Cheerios, Oatibix, granola).

Choose bran cereal (e.g. Bran Flakes, All Bran).

Choose oatmeal biscuits (e.g. Hobnobs, Oat Cakes, Flapjacks).

Bread
Choose granary or mixed grain bread in preference to white, brown or wholemeal bread.

Pulses
Include beans, peas, lentils and barley into your diet (e.g. butter beans, kidney beans, baked beans, haricot beans, chick peas, soya beans).

- Add pulses to casseroles, stews and soups. Tinned beans and lentils are available in the shops that require no soaking.
- Baked beans on toast is a good lunchtime meal.
- Adding pulses to meat dishes will make the dish go further, and add flavour
- Add beans to a salad to add texture, colour and flavour.

Pasta
Use pasta or noodles to replace potatoes more often at meal times - dried or fresh.

- Have pasta salad as an alternative to sandwiches in your lunch box.

Fruit

- Apples, cherries, dried apricots, dates, figs, grapefruit, peaches, plums, oranges, grapes, pears, are all low glycaemic index foods. Include them as a snack between

meals or at meal times e.g. added to breakfast cereal, with yoghurts as a pudding.

Diary Products

- Diet yoghurts are useful as a dessert or snack.
- Ice cream is a good choice for a pudding occasionally.
- A drink of milk with breakfast.

K1 Exercise

This leaflet has been produced by Francesca Annan Paediatric Dietitian, Alder Hey Children's hospital. We are extremely grateful for her allowing us to put it on the web site.

Information about exercise and diabetes for children and young people on multiple daily injection therapy (MDI)

Being active is an important part of a healthy lifestyle. Increased activity levels can make diabetes more difficult to manage at times. This information will help you to understand how to keep your blood glucose levels stable during exercise. Because exercise is part of a healthy lifestyle try to make low fat food choices when you need extra carbohydrate.

Physical activity may be daily activities like walking or playing or sports. If you need specific diabetes management help or advice please contact your diabetes team.

About exercise

First, you need to know a bit about different kinds of exercise to help you keep your blood glucose levels stable. Different types of exercise (aerobic or anaerobic) have different effects in your blood glucose levels. The length of time you are active for, and the amount of insulin in your body, will also alter your blood glucose levels. Exercise that lasts for longer than 1 hour will typically have more of blood glucose lowering effect.

What happens when you exercise?

This will depend on the type of exercise you do, the amount of insulin working in your body and how long you exercise for. We have a store of fuel in our muscles and liver that can be used at the beginning of exercise. This usually lasts about 45 minutes. However, if insulin levels are high (for example just after a meal bolus) the liver cannot produce glucose for the muscles to use and blood glucose can drop rapidly.

You need just enough insulin during exercise to make sure that your liver produces just enough glucose for your working muscles. Low insulin levels will allow your liver to release too much glucose and may cause ketones to appear. If you have ketones and a high blood glucose level you need to treat this before you exercise.

What happens to your blood glucose levels during exercise will depend on what type of activity you do and how much insulin is working. Different types of exercise have different effects on your blood glucose;

- Aerobic exercise (which uses oxygen) will usually lower your blood glucose dropping during and after exercise, examples include running, swimming, cycling
  - if your exercise lasts longer than 30 minutes you will probably need to reduce your insulin and/or have extra fast acting carbohydrate
  - for exercise that lasts for less than 30 minutes you may not need to lower your insulin but you may need a little extra carbohydrate

- Anaerobic exercise (does not need oxygen) may make your blood glucose rise during the exercise and fall after the exercise. Anaerobic sports are usually short, sharp & fast or strength and power sports. Examples include, sprinting, basketball, weight lifting.

- Some sports will be a mixture of aerobic and anaerobic exercise; e.g. football and team sports. Mixed exercise may produce steady blood glucose levels.

You will need to learn how different activities affect your blood glucose both during and after your exercise. To do this check your blood glucose levels before any exercise, every 20minutes during exercise and at the end of the exercise and between 2 & 3am after vigorous/hard or long bouts of exercise.

Adjusting your insulin

You should aim to keep your blood glucose level around 7-8mmol/L before and during exercise you can adjust both the long acting background (basal) and fast acting food (bolus) insulin to do this.

Fast acting meal time insulin (bolus insulin)

If you eat 1-2 hours before exercise then you can make a reduction in your mealtime fast acting insulin dose to help prevent low blood glucose levels during sport and then make a similar reduction with food eaten after exercise to prevent low blood glucose levels after exercise.

- You may need to lower your insulin by 25-75% if you give an injection with a meal 1-2 hours before exercise.
- If your exercise is more than 2 hours after a meal and insulin injection bolus you may not need to make any reductions

Meal time insulin should be injected before eating before exercise, also try and use the same injection area for regular exercise. For example if you have a regular training session after an evening meal always your insulin in the same area for the meal before exercise on that day. You should also think about avoiding injection sites that are near the active muscles e.g. avoid your legs if you are running.

Background insulin

Your long acting background insulin may also need to be adjusted to help prevent low blood glucose levels after exercise. You may find this easier if you have 2 injections of long acting insulin a day, one in the evening and one in the morning. This will mean you can adjust your day time and night background insulin levels separately.

Long acting insulin doses will need to be reduced when you are going to be active all day, when your activity is strenuous and if you are exercising again the next day. Background insulin may need to be reduced by 25-50%.

Active Insulin

If you use a smart blood glucose meter with a bolus wizard/advisor you can check how much active insulin is present before you do any exercise. If your blood glucose level is ok and you have active insulin you should take some extra carbohydrate before you start. Reverse your insulin to carb ratio; if your ratio is 1unit to 10g carbohydrate take an extra 10g fast acting carbs at the beginning of the exercise for every unit of active insulin.

Blood glucose before exercise

Aim to have a blood glucose level around 7-8mmol/L before and during exercise. If your blood glucose level is above 14mmol/L you should check for ketones. You can exercise with a higher blood glucose level without ketones, but you must check your blood glucose levels and drink plenty of fluid. If your blood glucose level is between 5 and 8mmol/L start having any exercise snacks at the beginning of your activity.

Use the table as a guide

Blood glucose	Aerobic exercise	Anaerobic exercise
< 5mmol	Bring blood glucose back to normal, have extra carbohydrate at least 1g/kg per hour of exercise	Bring blood glucose back to normal, have extra carbohydrate at least 1g/kg per hour of exercise
5 -8mmol	Have exercise snacks, 15g for each 30minutes of activity.	No changes required if the activity is <30minutes. Consider exercise snack if exercise lasts longer than 30minutes.
8 – 11mmol/l	No change required for activities <45 minutes. If exercise lasts longer than 45minutes exercise snacks will be needed.	No changes required if exercise is <30 minutes. Exercise snacks may need additional insulin.
11 + mmol/L	Check for ketones and correct* blood glucose. Have exercise snacks with insulin for performance. Drink fluid during exercise	Check for ketones and correct* blood glucose. Have exercise snacks with insulin for performance Drink fluid during your exercise

*Only use half corrections during exercise

If you have a high blood glucose level and ketones you should delay exercise until the ketones are no longer present.

Keep a record of the insulin adjustments you make and your blood glucose responses to different types of exercise. This will help you to plan the insulin adjustments you need to make.

Exercise Snacks

Exercise snacks can be eaten to prevent hypos or they may be needed for sports performance. If you are having exercise snacks for performance you should talk your dietitian about how much carbohydrate you need for each hour of exercise. Food eaten to maintain your blood glucose levels should be low fat.

If you are exercising for 60minutes or longer it is a good idea to have some carbohydrate during your exercise. Try and spread your extra carbohydrate across the exercise by having something every 20minutes. If your activity lasts 60minutes or longer, you should also think about eating some supper before bed.

Carbohydrate snacks can be used to prevent low blood glucose levels during exercise. The amount you need will depend on the insulin adjustments you have made and the type and duration of activity you are doing.

Aerobic exercise that is more strenuous or intense or that lasts longer than 45 minutes can need 1g carbohydrate for every kilo you weigh. You will need more carbohydrate if you have not adjusted your background or food insulin doses.

To start, try having 15g of carbohydrate for each 30mins of activity and monitor regularly (every 30 minutes). If you have adjusted your insulin doses you should need less carbohydrate to prevent hypoglycaemia.

The amount of carbohydrate you need will vary with different activities as some sports use up more calories (energy) than others

Suitable exercise snacks include

- Sports drinks/gels
- Jelly sweets
- Ordinary sugar containing drinks
- Dried fruit
- Jaffa cakes

Drinks for Sport

It is also important when you are being active that you have plenty to drink.

- Drink 2-300ml before any exercise.
- Try and drink during your exercise as well, about 100ml every 10-15minutes.
- If you are exercising for an hour or more always have a sports drink, then you get the fluid you need and the extra carbohydrate as well.
- If you are exercising for less than 60minutes water is fine.

Sports performance snacks

If you exercise for 60minutes or longer and need sports performance snacks you may need to give insulin with these snacks during competitions/matches and anaerobic exercise. If you need to give fast acting insulin with food use half your normal insulin to carbohydrate ratio and check BG every 20-30minutes if possible.

If you are training regularly and would like advice about how to eat to improve your performance ask in clinic

After exercise

After exercise you may experience low blood glucose levels for up to 12 hours later. Usually after exercise you will be more sensitive to your insulin and may need to use lower background insulin doses and reduced insulin to carbohydrate ratios with meals/snacks.

Eat a snack before bed whenever you do 60 minutes or more exercise in the afternoon or evening. This helps to maintain BG levels overnight. A mixture of carbohydrate and protein helps your muscles and liver to replace their glycogen stores. Examples of good bed time snacks include milk shake and fruit, cereal and milk, crumpets with peanut butter. The bedtime snack usually does not need any fast acting insulin.

If you experience high blood glucose levels at the end of exercise you can use a ½ correction dose to manage this. It is a good idea to wait 30minutes and recheck the blood glucose to see if it starts to fall on its own before giving a correction dose.

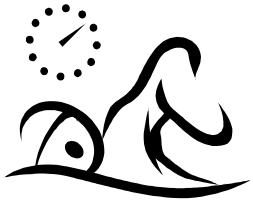
- Check BG levels regularly, as after 1-2hours the BG will fall.
- You may find that high levels at the end of exercise will fall without additional insulin.
- If your BG is always raised at the end of exercise make changes to your insulin to prevent this from happening.

This information has been produced for use by diabetes healthcare professionals by

Francesca Annan, BSc, Pg Cert, RD

Paediatric Diabetes Dietitian

February 2012

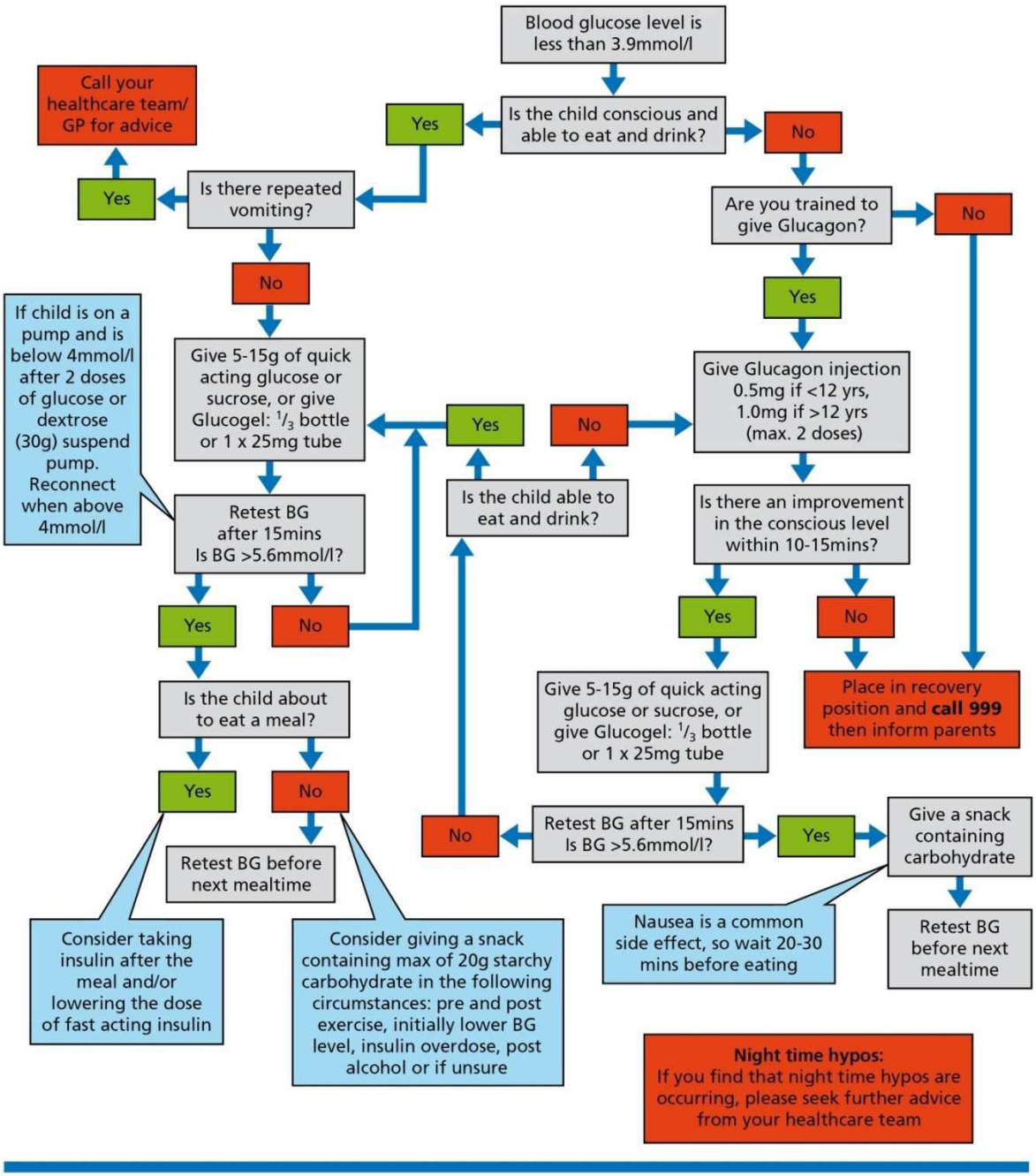


L1: Hypo poster

Leeds Children's Hospital

Leeds Paediatric Diabetes Team

Managing Hypoglycaemia in Type 1 Diabetes



Created by Leeds Paediatric Diabetes Team May 2010.
We would also like to acknowledge the collaboration of Dundee, University College London and Leeds in making this possible.
Poster printed by Medical Illustration Services, The Leeds Teaching Hospitals NHS Trust. Job ref: 2010052081/NR

L2: Sick day rules of injections

Sick day rules for children on Injection therapy

When blood glucose level rises over 14 mmol/L during illness

START: Blood Ketones Over 0.6 mmol/L?

No

Give a correction bolus.
Check blood glucose (target 7-10mmol/L during illness) and ketone levels every 1 - 2 hours.
Look for possible cause.
If child is not hungry see final box.
Contact Diabetes Team if no improvement or if you are unsure

Yes

Is child drowsy, with heavy, laboured breathing?
Not passing Urine, vomiting, refusing to drink?

Yes → Call ambulance

N0

Give correction doses every 2 hrs
until you are back in control
Consider increasing long acting insulin by 20%

If blood glucose levels are over 11mmol/l
give another correction dose

If blood glucose levels are decreasing
gradually reduce

If blood glucose levels are increasing

Continue 2 hourly correction doses
Usual correction doses may need to be increased
Increase L/A insulin in steps of 10 or 20%.
Contact team if unsure at any time

Check blood glucose and ketone levels every 1-2 hours.
If child is not hungry, give small amounts of carbohydrate containing fluid e.g. fruit juice, ice-cream, yoghurt, sugary drinks etc.
Contact Diabetes Team/Hospital if child is vomiting or you are unsure

Sick day rules for children on insulin pump therapy

When blood glucose level rises over 14 mmol/L during illness

START: Blood Ketones Over 0.6 mmol/L?

No → Give a correction bolus through the pump. Check blood glucose (target 7-10mmol/L during illness) and ketone levels every 1 - 2 hours. Look for possible cause. If child is not hungry see final box. **Contact Diabetes Team if no improvement or if you are unsure**

Yes

Is child drowsy, with heavy, laboured breathing? Not passing Urine, vomiting, refusing to drink?

Yes → Call ambulance

N0

Give all correction Doses BY PEN until you are back in control Check pump

If blood glucose levels are over 11mmol/l give another correction dose

If blood glucose levels are decreasing gradually reduce temporary basal rate

If blood glucose levels are increasing
Continue up to 2 hourly correction doses
Usual correction doses may need to be increased
Replace infusion set & check pump.
Increase temporary basal rate by 20% .
Increase every 2 hours if not improving
Contact team if unsure at any time

Check blood glucose and ketone levels every 1-2 hours.
If child is not hungry, give small amounts of carbohydrate containing fluid e.g. fruit juice, ice-cream, yoghurt, sugary drinks etc.
Contact Diabetes Team/Hospital if child is vomiting or you are unsure

M1: Parental Information Leaflet

Department of Clinical and Health Psychology

Paediatric Diabetes

A Parental Guide to Clinical Psychologists in the Diabetes Team

Introduction

Diabetes can be very hard to live with at times, and as a parent or guardian of a child with diabetes, it is common to feel overwhelmed with the additional responsibility and disruption that it can sometimes cause to family life. You may notice changes in your child's behaviour or mood, or may be struggling to encourage your child to manage their diabetes well. Despite your best efforts to help your child or change their behaviour, sometimes things just don't seem to improve, and if this is the case, the Clinical Psychologist for Paediatric Diabetes can work with you and your child to help.

What does a Clinical Psychologist do?

Clinical Psychologists can help with a wide range of difficulties relating to having diabetes, including…

- Fear of hypoglycaemia
- Stress around living with diabetes
- Worries about weight and body image
- Arguments and relationship problems caused by diabetes at home
- Anxiety and fear of having injections or medical examinations
- Difficulties managing the treatment regime

Clinical Psychologists are not medical doctors so they will not change your child's treatment or prescribe medication. However, if you feel that your child's treatment isn't working well, the Psychologist can help to communicate this with your doctor or nurse.

What happens during my sessions with a Clinical Psychologist?

During your first appointment, the Clinical Psychologist will usually work together with your child and yourself together as a family. However, if you prefer, the psychologist can work with family members independently. The Clinical Psychologist you see will keep a summary of the issues you have discussed in your meeting and this information will remain confidential and will not be shared or given out to anyone who is not concerned with you or your child professionally. However, all members of staff have responsibilities to protect children from harm and are legally bound to inform other professionals if a child is thought to be at risk. Under these circumstances, the Psychologist would of course, discuss this with you first.

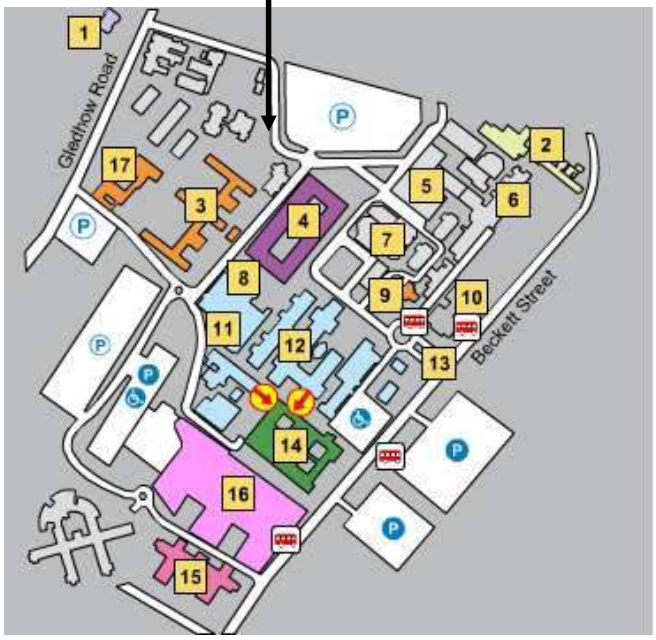
Who will you see?

The Clinical Psychologist who will see you for your appointment will be a Senior Clinical Psychologist from the Department of Clinical and Health Psychology. They works very closely with the Paediatric Diabetes Team, and sees many children, young adults and families who are living with Diabetes.

On occasion you may be seen by another member of the Clinical team or by a member of staff in a position of Clinical Training. On all occasions that you attend an appointment, each time it will be with same member of the team.

Where will you be seen?

You will either be seen at the **Department of Clinical and Health Psychology, Fielding House, St James's University Hospital, Leeds, LS9 7TF (see map below)** or where you normally go to clinic.



ST JAMES UNIVERSITY HOSPITAL

1. Staff Creche
2. Ashley Wing
3. Trust HQ
4. Gledhow Wing
5. Institute of Molecular Medicine
6. Thackray Medical Museum
7. Clincal Sciences Building
8. Paul Sykes Urology Centre
9. Chapel
10. Paediatric Day Unit
11. David Beevers Theatres
12. Lincoln Wing
13. Site Entrance
14. Chancellor Wing
15. Beckett Wing
16. Bexley Wing
17. Education Training & Development Centre

- Visitor Parking
- Disabled Parking
- Staff Parking
- Bus Stop
- A & E Entrance

How long will I see the Clinical Psychologist for?

This will depend on what is discussed and decided with the Psychologist when you meet. Some people have just one session with a Clinical Psychologist, whereas others may have many more. We can work with you on your own or with your family. We can decide what might be most helpful in the first meeting.

The psychologist will try to give you an idea of how many sessions you may need, but often this depends on your goals and progress made. It is sometimes the case that the psychologist may advise a referral to different services if this is felt more appropriate but you will always be kept informed.

What to do if you want to see a Clinical Psychologist?

If you feel that your child or family would benefit from seeing the Psychologist, please mention it to one of the nurses or doctors involved in your care. They will then contact us with a brief summary of the difficulties you are experiencing. Sometimes it may be decided that Clinical Health psychology is not the best service to meet your child's needs and if this is the case you may be referred or directed to an alternative service with your consent.

The Department of Clinical and Health Psychology will then contact you either by letter or telephone to arrange an appointment time.

Missed appointments

In the event that you are unable to attend your appointment, can you please telephone the Department to cancel on 0113 206 5897 as soon as possible. This enables the team to provide you with another appointment and for your appointment to be offered to another child. In order to manage our waiting list effectively, it is Leeds Teaching Hospitals Trust policy, that if you do not attend a clinic appointment and fail to give reasonable prior notice, this will result in your child being discharged from the Clinical and Health Psychology Department.

M2: Information leaflet for Children/Teenagers (7 - 12 years)

Department of Clinical and Health Psychology

A Children's Guide to Clinical Psychologists in the Diabetes Team

Introduction

Living with Diabetes can be hard at times, and most people with Diabetes struggle with it at some point. It is absolutely normal to feel fed up and frustrated with Diabetes, but sometimes these feelings grow stronger and people can feel that they need extra help. A Clinical Psychologist can help you and your family to talk about these feelings and work out a way to make things easier.

What can a Clinical Psychologist help me with?

Clinical Psychologists have helped other children with:

- Worries about needles and injections
- Feeling very down about living with Diabetes
- Worries about going hypo
- Worries about managing your diabetes in school
- Feeling very angry about Diabetes (which might be causing stress at home)
- …and lots more!

Clinical Psychologists don't give medication or change your treatment, but if you or your family think your treatment isn't right for you, the Psychologist can talk to your doctor or nurse for you.

What will happen when I see the Clinical Psychologist?

When you come for the first time, the Clinical Psychologist will talk with you and your parents together to find out what you would like help with. If you come more than once, it is sometimes useful to see the Psychologist on your own, but only if you want to. Sometimes only your parents may see the Psychologist.

Who will I see?

There is a Clinical Psychologist for children with Diabetes, who knows the Paediatric Diabetes Team well, and sees many children like you who are living with Diabetes. Some people may get an appointment to see a different Psychologist who works with the psychologist, but you will always see the same Psychologist every time you attend.

How long will I see the Clinical Psychologist for?

The amount of times you see the psychologist will depend on if you want to talk to them and if the psychologist thinks you need to see them again. Some people come just one or two times, and other people come for many more sessions.

M3: The importance of control in preventing long term effects of diabetes:

1. Introduction:

Many teenagers have asked us for information on the long-term complications of diabetes. We have tried to summarise these briefly below but it is better to take the opportunity to discuss these with the diabetes team. We have tried to be open and honest but also explain that by working with the diabetes team and aiming for good control you will **considerably** reduce the risk of these occurring.

2. Background:

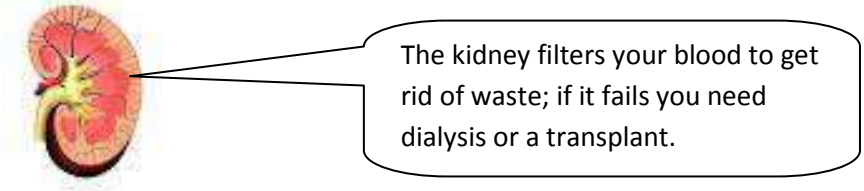
The body is designed to keep glucose levels in the blood within a very narrow margin (4-7mmol/l). The only hormone which lowers glucose levels is insulin. As in type 1 diabetes you are unable to make insulin, you have to try instead to match the injected insulin dose with the carbohydrate containing food you eat. If glucose levels are running high then over time this is '*poisonous'* to the blood vessels, particularly small vessels as seen in the eye and kidney. It is almost as if the blood vessels 'age' quicker than normal and become fragile some bruising easily.

A study in the United States (DCCT) showed very clearly that good control really reduced the risk of all complications and this effect lasted quite some time. It is therefore really important to try and get good control from diagnosis and then maintain it throughout. This is tough but is possible using intensive insulin regimens (multiple daily insulin and/or pumps).

3. Nephropathy (kidneys)

One of the first signs of problems occurring in the kidney is the leakage of an excess amount of protein into the urine. Your diabetes team will test for this once per year. If positive the test will be repeated using a sample of urine collected as soon as you wake up in the morning when you have rested.

Another important sign of a kidney problem is a rise in your blood pressure. This should be checked at clinic and if significantly high and particularly if it is associated with the 'protein' leak then medication will be required (ACE inhibitors).



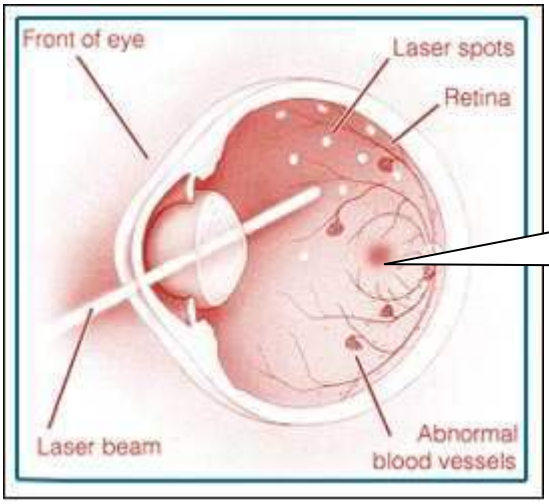
To minimise the risk of these problems occurring it is important to

- Keep as good control as possible
- Not to take up smoking- as it is known that smoking increases the risk considerably.
- Try and maintain a healthy weight for your height.

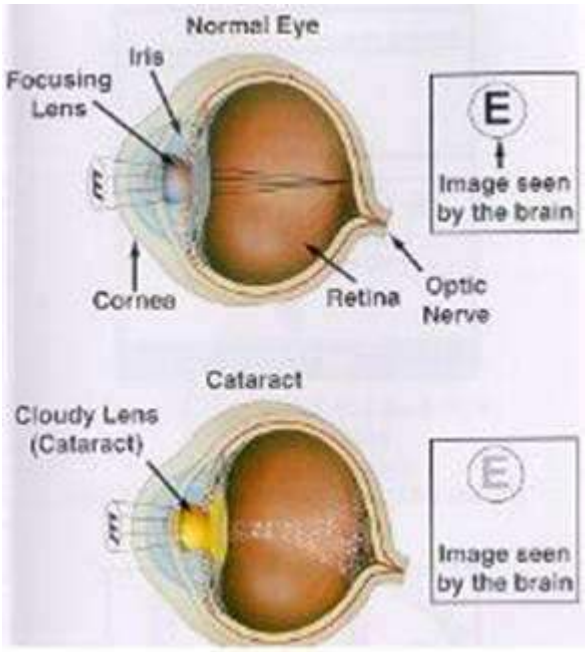
4. Retinopathy (eyes)

The small blood vessels at the back of the high are particularly susceptible to damage from high blood glucose levels. Over time this can lead to leakage of blood into the back of the

eye (retina) and damage your ability to see. This is particularly serious if it occurs in the part of the eye associated with fine vision (macula).



The lens of the eye can also be affected by high glucose levels leading to cataracts. This leads to a blurring of your vision and may require surgery.



To minimise the risk and to stop further problems if detected it is important to:

- Maintain good control of diabetes-discuss this with your diabetes team.
- Avoid smoking.
- If recognised it can be treated by using 'a laser' but it is better to try and avoid the complication if at all possible.

4. Sexual Health

At the time of diagnosis this may appear to be one of the least important things on your mind. As you reach adult life the ability for normal sexual relationships becomes increasingly important. To minimise the risk of complications occurring then it is important to try maintaining good control from diagnosis. The problems that can occur include:

- In females high glucose levels can be damaging in pregnancy. If you are planning to have children it is very important to discuss this with your diabetes team early on. You will need to obtain good control and try and keep good control throughout pregnancy but importantly follow advice before conceiving (getting pregnant) to minimise the risk to your baby. By doing this you can have a healthy pregnancy and have a healthy baby. If you suspect you are pregnant do discuss with your doctor and diabetes team immediately.

- In males poor control may over time be associated with difficulty achieving an erection and in having a normal sex life. Although there are potential treatments for this it is better to prevent this in the first place. Do discuss with your diabetes team.

5. Neuropathy (nerves)

Problems associated with the nerve supply to your body (similar to the electric supply to your house) are rarely recognised in childhood but can start to appear very slowly. There are two areas which can be affected:

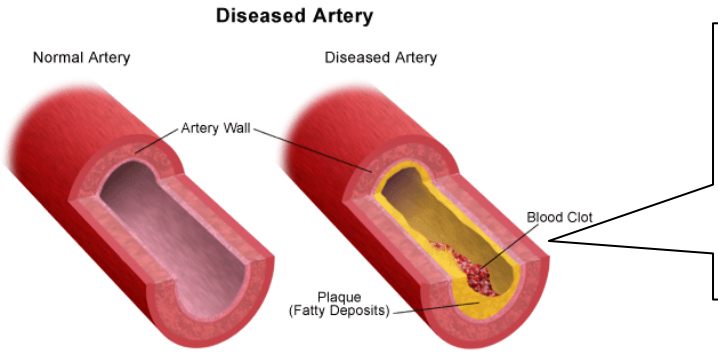
- The long nerves to your legs and arms can lose the ability to feel 'touch and sensation'. This can makes it difficult to feel and pick up small objects as well as dizziness and faint.

- The nerves to your stomach can be affected making it unable to empty properly leading to a feeling of sickness and at its worse frequent vomiting.

As with all long term complications minimising the risk relies on trying to obtain good control and maintaining it. Use your diabetes team to help with this.

6. Blood vessels

The large blood vesels in your body can collect fat and 'fur up' like a kettle, this narrows your blood vessels and makes you more susceptible to heart damage. This is important to **everyone whether they have diabetes or not** and the risk can be reduced enormously if you:



Human artery: picture shows how damage can occur with thickening of the wall and clots of blood forming. Compare this to the normal one next to it.

- Avoid smoking at all costs and make every effort to stop if you have started (Try and not be exposed to a smoky environment).
- Eat healthy including your 5 'fruit and vegetables'.
- If you have diabetes to aim for good control.
- Try and exercise regularly 30 minutes per day minimum.

7. Your bodies memory (metabolic memory)

You may hear or read about some experts in diabetes talking about your bodies 'metabolic memory'. What they mean is '*what your average diabetes control is like over the period you have had diabetes'*. The HbA1c test is a marker of glucose control the nearer that is to 58mmol/mol in new units or 7.5% in old units the better, whether you have had diabetes for 2 or 20 years. It is also tells you that even if you have a period of bad control it is worth improving.

Date	**Person A (HbA1c)**	**Person B (HbA1c)**
January 2011	9.5	12.3
March 2011	8.0	11.0
June 2011	7.5	9.0
September	7.1	8.1
January 2012	6.9	9.1
April 2012	7.1	11.0
July 2012	7.0	10.1
October 2012	7.8	9.1
Average over 2 years	**7.6**	**9.8**
Comments	Obtained good control quickly and has maintained a good average result over 2 years.	Started with high HbA1c improved initially down to 8.1 but never really obtain good control, average result over 2 years is poor.
Although it is better to obtain good control as soon as possible after diagnosis it is **never too late** to get good control this will always help improve the situation and reduce risk of complications. Look at the 'Top Tips' leaflet listing ideas which have been shown to give good control. If you have found something which has helped please email us we can add it to the list or discuss on the forum.		

At the time of your diagnosis your parents may have searched the internet and have read all about these problems and will be worried. The Diabetes team is here to help minimise this risk. Do discuss it with the team-it is really important to understand how you can reduce this risk to very low levels if you work at it now.

M4: Top Tips-some ideas to think about which will help with your diabetes

Listed below are ideas which have been shown to help improve diabetes control. These ideas have been collected from the diabetes team, parents and children with diabetes and from articles about diabetes. Try and introduce 1 or 2 at a time and see how it helps. Improving control will make you feel better, be more confident and positive about your diabetes. Tick the box if you are doing it.

Ideas around testing and injecting:

1. Do rotate your injection sites every day. Injecting in the same site will lead to poor control and swinging blood glucose levels (see blood glucose testing). ☐
2. Always remember to give your bolus insulin with food and drink containing carbohydrates. If you forget ask about a device you can add to your pen which tells you when you last had insulin. On pumps look at your memory. ☐
3. Inject insulin **before** food, if possible 10-15 minutes before. This requires a bit of planning, but if you can do this for your main meals it is a very good start. ☐
4. Test your blood glucose before each main meal and at bedtime as a minimum. This allows you to correct high levels. (Use glucose tracker to look at your results if uncertain). The best results are achieved by testing more than 4 times per day. ☐
5. Give insulin with snacks unless treating a hypo. You will be surprised how high your glucose level may go even if you have a small snack (see Snack attack for ideas for food without the need of insulin). ☐
6. Although you may be rushing it is important to have some breakfast even if it is only a fruit drink or piece of toast with insulin. If you starve for long periods your body produces ketones and your insulin will not work so well. ☐
7. If you are on multiple daily injections try not to forget your long acting insulin, link it to something you do everyday such as cleaning your teeth. ☐

Ideas around food

1. Make sure you know your correct insulin to carbohydrate ratio for each meal. If you are uncertain consider a test meal or discuss with your diabetes team (see test meal). ☐
2. Don't guess your insulin dose, try and work out the carbohydrate content of the food and then calculate the dose. ☐
3. Consider trying a meter which helps you calculate your dose or if on a pump make sure you use the bolus calculator. ☐
4. Work around your favourite meals first and get the dose right for these. Do this by testing your glucose before the meal, have your insulin and meal and then test 2-4 hours later. The glucose level 2-4 hours after food should be no more than 2 mmol/l above or below the pre meal dose. If it is high have the meal again and give an extra unit and see if this is better. (see favourite foods) ☐

5. If you are uncertain about how much you want to eat then give a dose at the beginning of the meal but top up with more insulin as soon as you know you want to eat more e.g. extra potatoes, extra slice of pizza, a pudding etc ☐
6. Many snacks can increase your glucose level quite a lot and require insulin-do give insulin with snacks. ☐
7. For big meals, those containing more than 80 grams of CHO, particularly if it is food where the glucose is in the form of starch or the food contains quite a lot of fat it is sometimes necessary to split your bolus and give 50% at the beginning and the rest half way through. Those on the pump can give a duel wave bolus or extended bolus. ☐

Ideas around lifestyle

1. Discuss diabetes with your closest friend/partner and ask them to help e.g. blood testing ☐
2. Plan a little in advance for new events e.g. holidays, exams, job interview and think how to make sure you are at your best and well controlled so that you can enjoy it (holidays not exams!!). Seek advice from the diabetes team ☐
3. If you are going out with friends, make sure you have your diabetes equipment (have a small bag you can carry them in), glucose sweets and wear a medic alert bracelet- a simple safety idea. ☐

N1: Diapedia

Autoimmunity: The process by which the body developes 'antibodies' (like when fighting infection) but these are directed against some part of the bodies own tissues. In diabetes it is against the 'islet cells' which make insulin, resulting over time to the failure to make insulin and type 1 diabetes.

Bolus insulin: This refers to the insulin given as a single dose usually to cover carbohydrate containing food/drink (food bolus) or to correct if one is running high (correction bolus).

Basal insulin: Those without diabetes even if they starve will have a background level of insulin in the blood-this is required to deal with glucose released by the liver. This has to be mimicked and is either long acting insulin such as Glargine or Levemir or the 'basal' level of fast acting insulin delivered by an insulin pump over 24 hours. Your basal level changes over the 24 hours and in teenagers in particular are highest at 0400-0600 and 16.00-18.00 (Circadian rhythm).

Basal bolus regimen: This refers to combining bolus insulin (with food) with a long acting of insulin inn those who inject and continuous insulin in those on a pump.

Blood pressure/Hypertension: Each time you come to clinic your blood pressure should be checked. This can rise in association with poor control and may need treatment with tablets. It is rare to occur in childhood. You can minimise the risk of this by maintaining good control, keeping your weight under control and avoiding being overweight and reducing the amount of salt in your diet. (Discuss this with your team's dietitain). It is bad news to start smoking this will contribute to hypertension.

Carbohydrates (CHO): These are food substances which are also called 'saccharides' which is Greek for sugar. They come in different forms (monosaccharide (e.g. glucose), disaccharide (e.g. sucrose, table sugar) and polysaccharide (e.g. starch). The rate at which they are absorbed from the gut varies but as a general principal the simple ones are absorbed quickly and the complex ones slowly.

Carbohydrate counting: This requires practise but if you get it right it improves your diabetes control. It can only be used to its best effect with basal bolus regimens (*see basal bolus*). In most cases particularly those on pumps it is the amount of carbohydrate which requires 1 unit of insulin. It is in part dependent on age and how long you have had diabetes. A 5 year old may start on 1 unit of insulin for 20 grams of carbohydrate where as a teenager who has had diabetes for many years may require 1 unit for 5 grams of carbohydrate.

Circadian rhythm: Most hormones in the body are released in different amounts at different times over 24 hours. This is controlled by the natural day night pattern and it in part explains 'jet lag' when you are flying across time zones and your circadian rhythms are disrupted. Due to the 'circadian rhythm' of two of the bodies hormones (cortisol and growth hormone) you need to make more insulin in the early morning and late afternoon.

CGMS or continuous glucose monitors: These are devices which are able to measure your glucose levels in the tissue by using a small probe inserted under the skin. As it is not measuring glucose in the blood there is a lag period so that they are not always good at measuring rapid hypos. There are two sorts one where the results are stored but cannot be viewed until downloaded and others where the result can be seen all the time; each have their own advantage. They are particularly useful to see what is happening at night or when you are trying to tighten control.

Dawn phenomenon: This occurs particularly in teenagers who are growing fast. It refers to the natural 'circadian' rise in blood glucose towards early morning. This is why on insulin pumps the basal rate of insulin often has to be higher at this time.

Diasend: This is a commercial system made in Sweden and allows the download of the majority of meters and 2 of the 3 popular pumps (Roche and Animas). This should be available in all clinics and you should be asked to bring all meters for download. The Diasend system can display up to 4 meters on one chart in a simple tabular and graphical display. Discuss this with your diabetes team if you do not download meters or pumps in clinic.

DKA or diabetic ketoacidosis: This very unpleasant problem is associated with becoming very dehydrated, fast breathing and vomiting. It is usually associated with high blood glucose levels but not always. Some people with diabetes will not have experienced it if diagnosed early and they are well controlled. The 'ketoacidosis' refers to the build up of ketones in the blood due to the breakdown of fats (*see ketones)*. This occurs if you have not had enough insulin (in sufficient dose or missed doses). This requires urgent admission to hospital.

Fats: These are an important source of energy; oils are a form of liquid fat (e.g. olive oil, sunflower oil). They are an important part of the diet but as they are so energy rich must be eaten sensibly to avoid putting on weight. Fatty foods which include certain chocolates can slow down the absorption of carbohydrates.

Glucose: a simple sugar (monosaccharide) which is absorbed through the gut very quickly and easily-the term sugar tends to refer to glucose but can consist of a load of different forms of sugars (*see sugars*). It is the main food source for the brain but is an essential energy source for the body as a whole. It is stored in the liver and muscles of the body. In the normal situation the blood glucose level is controlled very accurately to between about 4mmol/l and 8mmol/l. If the levels go too high, the glucose spills over into the urine and pulls water with it, this results in passing large quantities of urine in 24 hours and making you thirsty. Low glucose levels results in glucagon (*see glucagon*) being released which pushes your blood glucose up again but in diabetes it often goes up too far so a low sugar 'hypo' is often associated with a swinging blood glucose level.

Glucagon: This is a natural hormone secreted by the pancreas which is released when your blood glucose level is too low. It mobilises glucose from the liver and muscles in the body to stop your blood glucose levels falling too far. If you have type 1 diabetes this may be associated with an over swing in your sugar-the rebound seen after a hypo.

Glucogen; This is the trade name for artificially made glucagon (*see glucagon*) and comes in an orange box. This is used to treat hypos if the person is unable to swallow or take glucose by mouth.

Glycogen: Glucose is stored in the liver as a complex substance called glycogen. This acts as a source of glucose particularly when extra energy is required. It is converted back into glucose naturally when stimulated by glucagon released by the islets cells in the pancreas if your glucose level falls too low and similarly if you injected glucogen in severe hypo situations. Your glycogen stores only last about 12 hours if you do not eat and you start breaking down fats-the main reason for eating sensibly.

Glycation: You may hear your diabetes team talk about glycation. The HbA1c test is for 'glycated' haemoglobin and refers to the binding of glucose to proteins such as haemoglobin around the body. This can occur in all tissues of the body and if glucose levels stay high can lead to irreversible changes to these proteins similar to the 'ageing processes'. It is the mechanism by which microvascular disease probably occurs (*see microvascular*).

Glycaemic index: This may range from low to high and refers to how quickly glucose in the food is absorbed from the gut into your blood. Low glycaemic food is in general better and allows the food to be slowly absorbed examples include wholegrain bread, pasta. High glycaemic foods are best for treating hypos and tend to contain pure sugars. This is a complex area and you need to discuss with your dietitian particularly if you are on an insulin pump.

HbA1c: This term is often misunderstood; it is not a blood glucose level. It reflects the blood glucose level but is a measure of the number of red cells in the blood which have glucose stuck to them. Recently the way of measuring this has changed; in old units the ideal level is less than 7.5% or 58mmol/mol in the new units. Poor control is greater than 9.0% or 75mmol/mol. As red cells last about 3 months before they are replaced by the body it reflects the blood glucose level over 2-3 months.

Hormone: This is a chemical which is made and stored in a particular part of the body (e.g. insulin in the islet cells of the pancreas or thyroid hormone in the thyroid gland) but when released under specific situations travels around the body acting on all the tissues is a predefined way (e.g. insulin transfers glucose from the blood into the cells throughout the body)

Hypo or hypoglycaemia: This is a low blood glucose level usually defined as less than 4mmol/l. If it is associated with symptoms (sweating, moody and temperamental etc) it is classed as a 'symptomatic hypo' and needs urgent treatment. Common triggers for hypos are too much insulin for a given amount of food, increased exercise and alcohol.

Hypoglycaemic unawareness: This can occur over time and refers to the inability to detect when you are starting having a hypo. If you feel this is happening you need to discuss with the diabetes team.

Insulin: This is a *'hormone'* which is produced by very specific cells (*see Islet cells*) in your pancreas (*see pancreas)*. Insulin is very important in that it is released when your glucose levels starts to rise in your blood (e.g. after a meal or drink containing carbohydrate). Insulin allows glucose to move from the blood into your muscles and tissues and to be stored around the body.

Islet cell: The islets cells lie in the pancreas and are natural human glucose sensor which release insulin when the blood glucose level starts rising making the glucose move from the blood into the tissues (see photograph of islet cells taken through a microscope). It is these islet cells which get destroyed in the autoimmune process and stop your body making insulin.

Insulin pen: A simple device which allows you to dial the dose of insulin and inject it with ease. Some pens have 3 ml cartridges and some are disposable. For young children half unit pens are often better for accurate insulin doses.

Insulin Pump: This is another way of given insulin. There are several different makes available and they all deliver only fast acting insulin via a small tube placed under the skin. When used properly they can help you to get very good control of your diabetes and allows you to fit your diabetes management around your lifestyle.

Insulin resistance: This is seen in type 2 diabetes (*see type 2*) but is also important in type 1. It means that for a given amount of carbohydrate you need more insulin than you would expect. This tends to occur as you get older but is found at its most obvious during the growth spurt of puberty. This is why your carbohydrate ratio may be 1unit:10grms CHO at 7 years and 1:5 at 13 years. It is also found in association with high ketone levels when you are unwell or have not been having sufficient insulin and are poorly controlled with a high HbA1c. It is thought to be the main cause of type 2 diabetes in its early stages in association with being overweight or obese. It can improve on losing weight.

Insulin sensitivity (correction dose): All of you who are on fast insulin with each meal should know how much insulin to give to correct a high blood glucose reading (one greater than 8 mmol/L). In teenagers who have had diabetes for some years this is usually 1 unit for 2 mmol/l of glucose above 8mmol/L. In younger children or newly diagnosed it may be as little as 0.5 units for every 5mmols/L above 8. Your diabetes team should advice you about this.

Ketones: Everyone makes ketones if they are not eating regularly. In diabetes they are a particular problem and are triggered when your body is unable to utilise glucose-usually because the glucose is in the blood but there is insufficient insulin to make it transfer across into the tissues. It occurs associated with starvation or intercurrent illness in particular. Ketones can be measured in the blood or urine. They need to be treated by having adequate carbohydrate intake, sufficient insulin (often more than usual) and careful monitoring to see that they are settling.

Medtronic carelink system: As with Diasend this allows download of information from Medtronic pumps and the display in tabular and graphical forms. There is a home version

which you might want to try-ask your diabetes team about this. If combined with contour glucose meters allows display of blood glucose levels as well.

Microvascular: This refers to the small blood vessels of the body which occur throughout the body they can actually be seen in the back of the eye and are very common in the kidney. They get damaged by high sugar levels (*see glycation*) and explain why the eye and kidney are easily affected by poor diabetes control over several years.

Macrovascular: This refers to the larger blood vessels around the body such as those around the heart (coronary vessels). It is thought that they get affected by high glucose levels but in a different way from the small blood vessel.

Nephropathy: This refers to the long term damage which can be done to the kidney with poor diabetes control. It starts with protein from the blood leaking into the urine (the reason why you are asked to give a urine sample each year so we can test for it). If this continues the kidneys ability to clear normal waste material is impaired and kidney failure occurs. Early signs can also include high blood pressure (*see hypertension*). The risk of this can be minimised by good control and if it occurs can be helped by improving control and specific medication (ACE inhibitors).

Neuropathy: This is less likely to occur in childhood and can be difficult to diagnosis. It refers to damage done to the long nerves in the body leading to loss of sensation in your toes and hands. This may result in ulcers and damage to your skin. It can affect specific parts of the body such as the stomach (gastric paresis) associated with vomiting and difficulty eating. Good control minimises the risk of developing these problems.

Proteins: These are very important substances in the body and occur in all plants and animals. Insulin is a protein. They are made of building blocks called 'amino acids' and are crucial to a healthy body.

Premixed insulin: This refers to insulin solutions which contain fast insulin and longer acting insulin all together. It is usually given with breakfast and at tea. The fast insulin deals with the breakfast and main evening meal and the long acting insulin works through the rest of the day or night. It has the problem of having once been injected you must eat during the rest of the day otherwise you will go hypo. You cannot carbohydrate count with premixed insulin.

Retinopathy: This refers to the abnormalities which can appear at the back of the eye with poor diabetes control. It is graded from 1 to 4 and refers to the macula and retina specifically. The macula of the eye is used for fine vision and it is crucial for this to stay as healthy as possible. The risk of retinopathy can be reduced considerably by maintaining good control from diagnosis and avoiding smoking (both active and passive). The early changes are reversible with improvement in control.

Somogyi effect: Described by Michael Somogyi and is the falling of blood glucose levels at night and then rebounding high in the morning. The danger is that the high blood glucose level in the morning is interpreted as needing more long acting insulin but in fact you need **less.**

Sugar: This is often incorrectly used meaning glucose (*see also carbohydrate*). Glucose is the most simple and refined part of all sugars and is often the breakdown product of complex sugars like fruit sugars. The rate at which sugars cross into the blood from the gut is dependent on how complex it is and what you eat with it (*see glycaemic index*).

Type 1 diabetes: The alternative term is 'insulin dependent diabetes mellitus' (IDDM), this means that your ability to release insulin when you glucose levels rise is impaired. Eventually you will make no more insulin of your own and are dependent on the insulin you inject. Type 1 diabetes is caused by the body destroying the cells which measure your blood sugar and release insulin (*see Islet cells*) by a mechanism called 'autoimmunity' (*see autoimmunity*).

Type 2 diabetes: This is also called 'insulin resistant diabetes' as you continue in the early stages of the condition to make a lot of insulin but it does not work very well (*see insulin resistance*). This is commonly associated with being overweight and is more common when there is a strong family history of type 2 diabetes or in families who originally came from Asia and the Afro-Caribbean regions of the world. The keystone of treatment is weight loss, occasionally tablets and if not successful you will need to start injecting insulin.

N2: Research

The Leeds Children's Diabetes team try very hard to ensure you are always offered the most up to date treatment. Because of this we are often asked to participate in new studies. The children/ young people and families with Diabetes may be approached to help with research. This is entirely voluntary and they will be given age appropriate information before agreeing to participate. Where possible, this will always be sent to the home address to ensure they have the time and privacy to understand this.

If the child/ young person or their families should decline to take part, their clinical care will continue and will not be affected at all. They are also able to opt out at any time.

This help is invaluable if we are to continue to move forward with the management of diabetes and ensure each child is offered the most up to date care available.

Please feel free to contact:

Jane Exall, Childrens Diabetes Nurse Specialist/ Research Nurse.

on 0113 2064996 or jane.exall@leedsth.nhs.uk : if you would like information regarding any current or future studies that we may be involved in.

N3: Useful web addresses

General

Diabetes UK	www.diabetes.org.uk/
Juvenile Diabetes Research Foundation	www.jdrf.org.uk/

Medical alert bracelets

Medi tag alert bracelets	www.medi-tag.co.uk
Mediband	www.allergyessex.co.uk
Universal medical ID	www.identifyYourself.com
Medical tags	www.medicaltags.co.uk
Pen users to check last dose of insulin	www.insulcheck.com

Food related

Lenny the lion CHO teaching site:	www.lenny-diabetes.com/

General

Diabetes Power (family support group)	diabetespower.org.uk
Change for life-health advice.	www.nhs.uk/Change4Life

Pumps

Pump companies	
Medtronic	www.medtronic-diabetes.co.uk/
Animas	www.animascorp.co.uk/
Roche	www.accu-hek.co.uk/gb/products/insulinpumps/
Omnipod (via my life diabetes care)	www.ypsomed.co.uk

Insulin pump accessories

www.diabete-ezy.com

www.pumpwearinc.com

www.angelapumpstuff.com

www.funkypumpers.com

www.insulin-vests.co.uk

Pump support groups	www.childrenwithdiabetesuk.org www.insulin-pumpers.org.uk/support www.input.me.uk www.jdrf.org.uk/schools www.integrateddiabetes.com
Pumps and exercise	www.runsweet.com

N4: Holidays-how to enjoy them and still keep good control

Ideas

Listed below are some factors which may affect your diabetes whilst on holiday, in all cases it is best to discuss with your diabetes team before going away particularly if you are into 'extreme sports' or going too somewhere 'isolated'. Remember it is best to plan well in advance and get everything ready a week or two before.

1. Temperature (see also exercise below)

Hot Temperature: insulin needs to be kept out of direct sunlight, this is particularly important with pumps, so put them under a towel or clothing when in the sun. Use a cool bag to carry insulin.

Cold temperature: Insulin dose not tolerate being frozen, so keep it somewhere warm. Wear pumps under clothing and protected from freezing temperatures

2. Exercise

Most holidays involve more exercise, swimming, walking etc. To get this right does requires regular blood glucose testing and experimenting to see what is correct for you. Here are some ideas you might want to try, the more intense and prolonged your exercise a greater reduction will be required:

i. If on a pump put a 10-20% basal reduction and monitor blood glucose levels to see if they are okay.

ii. If on multiple daily insulin reduce your long acting insulin (glargine, detemir) by 10-20% on the day you leave.

iii. Bolus insulin: try your usual ratio to start with but this may need reducing. E.g. 1: 10 to 1:15.

iv. Snacks (ice cream etc) you may be able to have a limited number of these without insulin if you are exercising a lot.

3. Time zones

- Local flights to mainland Europe require no change but America or more than 3-4 hours time change requires careful planning.

i. It is important to get into the local time as fast as possible, so that you give your long acting insulin at the 'normal' time e.g. evening. Flying too America means you have a longer day, this delays your long acting insulin so you may need to give extra fast acting insulin. Flying back from America shortens your day so you should be careful not to overdose with long acting insulin and it is better to delay giving it if you have had your previous injection within 20-24 hours or reduce the dose by 30%.

ii. If flying long distances drink plenty of water and give insulin with food on the plane.

iii. If you are on the pump change the clock to local time as soon as you can.

4. Alcohol

i. If you want to drink alcohol it is best to combine it with food.

ii. If you are drinking a lot you are at risk of hypos, remember the symptoms of hypo and being drunk can be the same.

iii. Make sure your friends know what to do and how to treat a hypo.

iv. Wear an identity bracelet saying you have diabetes.

5. Spare equipment

i. Remember not to put it in your main luggage as it will be too cold in the luggage hold of the plane and it may get lost.

ii. Plan in advance to make sure you have enough insulin, hypogel and testing kit. If on a pump you must have emergency pens in case the pump fails. Some manufacturers will have a holiday scheme where they lend you a spare pump. You will need to know your basal rate and bolus ratios in case this happens.

iii. Split it up into different hand luggage

iv. Make a check list of what you must take with you.

v. If on a pump take the pump manufactures emergency contact number in case it breaks.

6. 'Extreme sports'

i. It is important to enjoy holidays and many teenagers wish to bungee jump, white water raft, tandem sky dive etc. It is good to do these things if you so wish but it is important to be safe.

ii. Check your blood glucose before hand to make sure you are not low. If the activity requires a lot of physical activity make sure you have some extra glucose tablets. It is your responsibility to make sure you are safe.

7. Insurance

i. Make sure you have health insurance covering your diabetes. Admission to hospital can be very expensive.

ii. Travel to the EEC requires having the appropriate form (European Health Insurance card) for emergency care. Ask at the post office.

iii. If on a pump make sure it is covered in case it is stolen.

Most importantly have a good holiday!!