Type 1 Diabetes Workbook

The Type 1 Diabetes Workbook has recently been reviewed and updated by the original Diabetes Education Network (DEN) working group.

The content of the workbook is based on the philosophy of encouraging self management and problem solving adopted by DEN.

It has not been designed to be didactic in its approach but to compliment education in the centres who have agreed to the DEN core curriculum and philosophy.

Therefore it was not intended to be changed or altered.

Any proposed local change must adhere to the overall philosophy and as a whole the workbook should not be added to or changed without discussion with or agreement by the DEN steering group.

Written and produced by the Type 1 diabetes collaboration
January 2009

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Local Phone Numbers:

About this workbook

Welcome to this workbook. It aims to offer background information to support the diabetes learning programme you are currently attending, but it is not designed to provide stand-alone information.

Some of the topics in the workbook are addressed using a question and answer technique and these sections try to cover the most frequently asked questions. You will also see symbols at various points and these are designed to stimulate discussion within your learning group or to encourage you to think about the way you manage your diabetes.

What do the symbols mean?

This symbol indicates something for you to think about, or a question

This symbol indicates something you may wish to discuss in your group

This symbol represents frequently asked questions

This is your own personal and private booklet; no one will ask to look at it, so you can keep it private or share it as you wish.

Introduction

Having diabetes creates many challenges and the more information you can gather about your diabetes, the easier it is to interpret your blood glucose readings and adjust your insulin. This course will discuss how insulin requirements change minute by minute, and how food, exercise, illness and stress all affect blood glucose levels.

Our aims are to:

- Listen to your views
- Enable you to more closely match your insulin to your food and lifestyle
- Enable you to manage your diabetes with fewer restrictions
- Share experiences with others

Thinking about the following questions may help you get the most from your course.

What are your reasons for attending this course?

What are you hoping to achieve?

What frustrates you most about your diabetes?

How do you want things to be different?

How will you know when you have achieved this?

My personal goal for the end of the course is:

What is diabetes?

Type 1 diabetes is a metabolic condition that results in increased blood glucose (commonly called sugar) levels due to a total lack of the hormone insulin. Although type 1 diabetes can occur at all ages, it mostly occurs in children and young adults, with a peak around pre-school and puberty.

Type 1 diabetes results from autoimmune destruction of the islet cells in the pancreas that produce insulin. This may be due to:

- Environment
- Virus
- Genetic tendency

Type 1 diabetes is treated by a combination of insulin injections and diet.

Why is insulin necessary?

- The body needs a constant supply of glucose that it uses as a fuel for energy.
- This supply of glucose comes from the food we eat and from stores in the liver.
- It is mainly the carbohydrate in our food that is broken down into glucose and absorbed into the blood stream.
- The glucose cannot enter the cells of the body and be used for energy without insulin.
- Insulin acts like a key. It unlocks the door of the cell and allows the glucose to enter.
- Surplus glucose is stored in the liver and muscles as glycogen. Once the liver and muscles are full, the rest is stored as fat.

You will find a diagram of the action of insulin in the body in Appendix 1 at the back of this workbook and you may wish to discuss this further in your group

What happens in type 1 diabetes?

- People with type 1 diabetes produce no insulin.
- Glucose cannot enter the body's cells and the levels rise in the blood.
- The body tries to get rid of this extra glucose by passing more urine, which in turn leads to thirst and dehydration.
- The cells are starved of glucose, which leads to tiredness and a lack of energy.
- The body begins to use body fat for energy, producing weight loss.

As soon as insulin is injected, the cell doors can open and glucose is now available for energy.

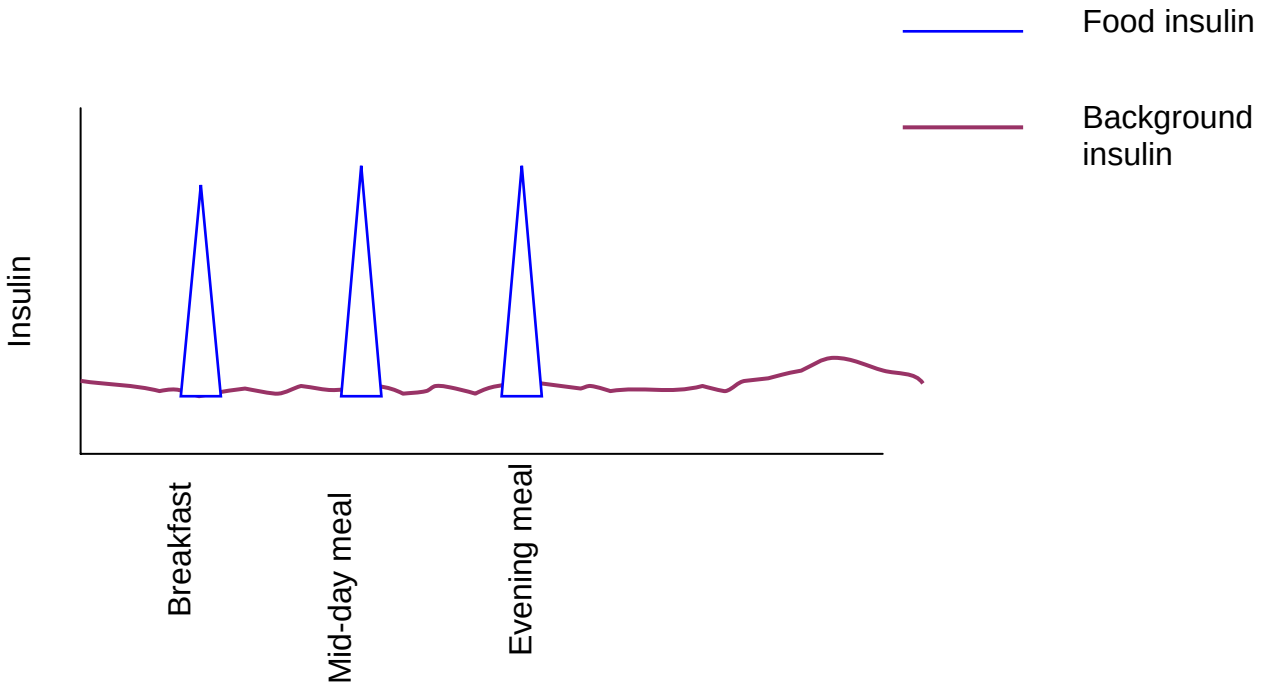
In people without diabetes, the amount of insulin is increased or decreased automatically to keep the blood glucose level steady.

What are the usual blood glucose levels in people without diabetes?

Insulin action

The diagram below represents what happens in someone without diabetes. Background insulin is necessary to maintain blood glucose levels whether people are eating or not. The pancreas produces a small amount of insulin continually to maintain normal blood glucose levels. The pancreas automatically increases or decreases insulin production according to the blood glucose level.

When food containing carbohydrate is eaten, the pancreas produces exactly the right amount of insulin to keep blood glucose levels within the normal range. The insulin that is secreted after breakfast, lunch and the evening meal is shown by the three peaks in the diagram below.



The aim of modern insulin treatment is to try and reproduce what happens in people without diabetes. This can be achieved by giving a background insulin and by giving rapid-acting insulin with meals.

You may wish to discuss this further in your group

The background insulin for people with type 1 diabetes is usually provided by 2 commonly-used longer-acting insulins. They are usually injected once a day and are called:

- Lantus (also called glargine)
- Levemir (also called detemir)

Another type of background insulin is called Isophane insulin and there are 2 commonly-used types:

- Insulatard
- Humulin I

What is your background insulin?

How would you check to see if your background insulin is right for you?

Blood Glucose Monitoring

Measuring blood glucose is a way of monitoring your diabetes. By using the blood test results you can learn how different things can affect your diabetes, such as the food you eat, the exercise you take, or illness and stress.

Blood glucose monitoring will give you information about YOUR response to all these. It should help you see what's working and what's not. Each blood glucose reading is a learning experience.

What are the benefits to you of blood glucose monitoring at the moment?

What may stop you doing blood tests?

What are your targets?

Recording blood glucose levels

Most monitoring diaries that you have used before will only have space for you to record the insulin dose and the blood glucose result.

This is missing out some of the important additional factors that we have just discussed. The power of monitoring depends on having enough information.

During your course you will be asked to use a more comprehensive diary so you can record the information, and this will help you make decisions about insulin doses and food choices.

Food and carbohydrate counting

The main type of nutrient in food that affects your blood glucose level is called carbohydrate (often written as CHO). Most foods contain a mixture of fat, protein and carbohydrate, but foods containing mainly protein and fat have a minimal effect on blood glucose levels compared to carbohydrate-containing foods. Carbohydrates are found mainly in starchy and sugary foods. All carbohydrates are digested into glucose and appear in your bloodstream between 10 minutes and 2 hours or more of eating. Carbohydrate counting is a system of assessing the amount of carbohydrate in each meal or snack and injecting insulin to match the amount you have eaten.

Why do people use carbohydrate counting?

Carbohydrate counting can give you more choice and flexibility in both the type of food that you eat and in meal timing. It can also help you maintain your blood glucose levels closer to normal levels.

Which foods contain carbohydrate?

Many foods are a mixture of protein, fat and carbohydrate and the main sources of each are shown in the table below

Food Group	Example foods
Protein	Meat, poultry, fish, eggs, cheese, nuts
Fat	Butter, margarine, vegetable oils, cream,
Carbohydrate	Starchy foods, sugary foods, fruit, milk

Protein foods alone will have little effect on your blood glucose levels, but some protein foods do have carbohydrate added during processing. This may be cereal or flour (sauces, sausages), breadcrumbs (fish fingers, chicken nuggets) or pastry (meat pie, pasties, quiche, sausage roll). You can check food labels for more information.

Fat has little effect on glucose levels after eating, but large amounts can slow the digestion of a meal and make your blood glucose levels rise more gradually. Examples of high fat foods meals which may have this effect

include fish and chips, hamburger and fries, and Chinese, Indian or Italian meals made with large quantities of oil or fat.

Carbohydrate foods will have the greatest effect on blood glucose levels after eating. They include all starchy and sugary foods. See below for more details:

Starchy foods

Starchy foods all contain carbohydrate. Examples include rice, pasta, noodles, bread (all types – wholemeal, white, French, pitta, naan bread), breakfast cereals, grains (couscous, bulgur wheat), flour (in pastry, sauces, pizza bases), plain biscuits and crackers and starchy vegetables (potato, yam, sweet potato, lentils, dried peas and beans).

Sugary foods

There are three main categories of sugary foods and all will raise blood glucose levels after eating:

Any food made with ordinary sugar (sucrose) contains carbohydrate. These foods include cakes, biscuits, chocolate, sweets, jam, honey, marmalade, puddings, desserts, squashes and fizzy drinks.

Fruit contains natural sugar (fructose). Fruit (e.g. apples, oranges, bananas, melon, mango) and fruit juice (both ‘natural’ or ‘unsweetened’ and sweetened) contain carbohydrate.

Milk and yogurt contain natural sugar (lactose). All milk, whether full-cream, semi-skimmed, skimmed, pasteurised, homogenised or long-life, and products made from milk (e.g. custard and ice-cream) contain carbohydrate.

Different foods contain different amounts of carbohydrate.

How can I work out the carbohydrate content of food?

There are different methods of calculating the carbohydrate content of food and you will learn more about this and have lots of practice in your group.

Weighing food

You can weigh your food using kitchen scales and work out the amount of carbohydrate in your portion by using food charts or food tables. This system is useful for foods like breakfast cereals, potatoes, pasta and rice as portion sizes can vary quite a lot between different people. If possible, weigh food using metric scales as most food tables give information *per 100g.* Once you have weighed your portion of food, you can work out the amount of carbohydrate by doing the following:

- Weigh food in grammes and note weight
- Look up the amount of carbohydrate per 100g in your food tables for the food you are eating and make a note
- Divide the amount of food you have weighed by 100
- Multiply the result by the amount per 100g from the food tables

Or you can use the following formula:

$$\frac{\text{Weight of food in grammes}}{100} \times \text{amount of CHO per 100g} = \text{amount of CHO}$$

Let's practise!

A portion of cooked rice weighs 200g
Use your food tables to find how much carbohydrate per 100g …….
How much carbohydrate in this portion? …….

A portion of your usual breakfast cereal weighs …….
Use your food tables to find how much carbohydrate per 100g …….
How much carbohydrate in your portion? ……..

Nutritional labels

Many food manufacturers now supply information on the label about the carbohydrate content of that food. Remember that you have to count the total carbohydrate and not just sugars or starches.

The information can be shown as either *per 100g* or *per portion.* If you use the value *per 100g,* then you will need to know the weight of the portion you are eating and you can use the formula above to work out the carbohydrate content. You may find the information *per portion* more useful, but remember that your portion size may not match that recommended by the manufacturer.

Let's practise!

Pepperoni Pizza (300g)

	Per 100g	Per 150g serving
Energy	275Kcals	412Kcals
Carbohydrate	25.3g	38g
(of which sugars)	3.4g	5.1g
Fat	12.4g	18.6g

This is an example of a label with nutritional information from a pizza. It gives information both per 100g and for 150g serving (this is half the pizza – the information at the top of the label tells you the whole pizza weighs 300g)

If you ate the whole pizza how much carbohydrate would you have? …….g

The Carbohydrate Portion (CP) System

A carbohydrate portion (CP) contains approximately 10g carbohydrate. You can use this system to calculate how many CPs there are in each meal or snack you eat.

CP Reference Tables

These tables contain information about typical portion sizes of the most commonly eaten carbohydrate foods and gives the CP value.
They also list the 'reference value'. The reference value is the same as the information given in food tables as *carbohydrate per 100g.*

Example from CP reference tables

FOOD ITEM	TYPICAL PORTION	CPs	CHO PER 100g
Apple Juice	200mls	2	9.9
Eating Apple	Medium (120g)	1 ½	12
Stewed Apple – no added sugar	6 Tablespoons	1	8

Some foods such as rice, pasta, potatoes are difficult to estimate as portion sizes can vary. You may find it useful to weigh portion sizes first to get an accurate assessment of the carbohydrate content and you can then convert to CPs. You can then use handy measures such as spoonfuls, cupfuls or bowlfuls to estimate the content of future meals.

Remember to divide the total amount of carbohydrate in your weighed portion by 10 to get the number of CPs.

Let's practise!

Look at the examples we used before.

How many CPs in 200g boiled rice? …… CP

How many CPs in your usual helping of cereal? …… CP

How many CPs in the whole pizza? …… CP

If you would like some more practice calculating the amount of carbohydrate in different foods, you will find some examples in Appendix 2 at the back of this booklet.

Eating Out

Many people find it challenging to try and calculate the amount of carbohydrate in foods and meals eaten away from home. As you become more practised at working out the carbohydrate content of the foods you normally eat, you may find it easier to estimate how much carbohydrate is in the foods you eat out.

Snacks

Carbohydrate counting means you can decide to have snacks based upon personal choice. You may find you need to take extra insulin with snacks, or you may decide to wait until the next meal or you may find you need no extra insulin. This will depend on your personal experience.

Missing meals

It may be possible to choose to miss a meal using this system, but this will depend very much on each individual. People are usually advised to eat regularly whether they have diabetes or not and this remains healthy eating advice. Blood glucose testing can help you decide if missing meals has an effect on your blood glucose levels.

Insulin dose adjustment

This section discusses the action of the insulin you take with food and gives more information about insulin dose adjustment. The insulin you take with food is commonly called rapid- or short-acting insulin.

There are 2 widely-used rapid-acting insulins:

- Novorapid (also called aspart)
- Humalog (also called lispro)

What is the name of the insulin you give with food?

How would you check to see if your food insulin is right for you?

What things may you need to consider before deciding on your rapid-acting insulin dose?

The amount of insulin you need with food is called the ‘insulin to 10g carbohydrate (1 CP) ratio’. This ratio varies from person to person.

You will calculate your personal insulin to carbohydrate ratio in your group

My insulin to carbohydrate ratio is:

…… units of insulin to every 10g carbohydrate/1 CP

You may find that your group expresses this ratio differently and you will discuss this in more detail.

What if my blood glucose levels are outside my target range?

If your blood glucose levels are higher or lower than your target ranges, you may need to increase or decrease the amount of insulin you take with your food. The most widely used term for this is ‘correction dose’. It varies between people, but is usually calculated using the formula below:

$$\frac{100}{\text{total daily dose of insulin}} = \text{correction dose}$$

The correction dose tells you how many mmols your blood glucose will change for every 1 unit of rapid-acting insulin you inject.

You will calculate your personal correction dose in your group

My correction dose is:

1 unit of rapid-acting insulin changes my blood glucose by …… mmol

When you are thinking about how much insulin to take, these questions may be helpful:

- How much carbohydrate am I going to eat?
- How much insulin will be needed for this amount of carbohydrate (using my insulin to carbohydrate ratio)?
- Is my blood glucose level within my target range?
- Do I need a correction dose?
- Have I eaten any carbohydrate within the last 2 hours?
- Have I had any insulin within the last 2 hours?
- Am I planning any exercise?

Other facts about insulin can be found in Appendix 3 at the end of this book

Summary

My insulin to carbohydrate ratio is:

……. .. units of insulin to …… g carbohydrate or CP

My correction dose is:

1 unit of insulin changes my blood glucose by …… mmol/l

Will your ratios always stay the same? What do you think may affect these in the future?

Section 2

Hypoglycaemia

Hypoglycaemia means low blood glucose and is commonly called a hypo.

Think back to your last hypo and consider the events that may have led to it.

The three most common causes of hypos are:

- Too much insulin
- Overestimation of carbohydrate content of food
- More physical activity than planned

When you have a hypo how do you feel?

What warning signs do you have?

When the blood glucose begins to fall warning symptoms occur and these can vary within individuals. As well as the symptoms you have experienced there may be many others.

There will be an opportunity to discuss this further in your group

The symptoms of hypos can be divided into mild, moderate and severe.

Mild Symptoms

These can usually be treated independently by you. The symptoms are caused by adrenaline release in response to low blood glucose levels. In conjunction with other hormones, it raises blood glucose by releasing stored glucose from the liver.

Moderate and Severe Symptoms

Moderate hypos often require the help of others and severe symptoms may mean a hospital admission.
These symptoms are caused by a lack of glucose supply to the brain, and are responsible for changes in behaviour and eventually unconsciousness if not treated.

What blood glucose level would you count as a hypo?

Do you have warning symptoms at this point?

Generally a blood glucose level of 4 mmols/l is defined as the onset of hypoglycaemia. The motto often used is “Make 4 the Floor”. Maintaining your blood glucose no lower than 4mmols/l allows time for you to recognise any symptoms and take the necessary action.

N.B. A hypo during the previous 24 hours may increase the risk of further hypos. Any hypos can lead to unpredictable blood glucose readings over the next 24 hours due to counter-regulatory response.

Treatment

There are many different treatments used for hypos.

What do you use to treat your hypos?

Self-treated hypos

In order to increase the low blood glucose levels as soon as possible, the ideal option is a glucose-rich food or drink. The table below shows some examples of treatment for hypos. You may be able to treat the hypo yourself, but if symptoms are severe, you may require help from others.

Food	10g CHO (1 CP) is found in:	15g CHO (1½ CP) is found in:
Glucose/dextrose tablets	3	5
Lucozade	50 ml	80 ml
Sports Drinks e.g. Lucozade Sport	150mls	230mls
Cola-type fizzy drink	100 ml	150 ml
Jelly babies	3	5
Jelly beans	7	10
Fruit pastilles	4	6

It is recommended that you take 20-30g (2 - 3 CP) fast-acting carbohydrate and then wait 10-15 minutes, re-test and if necessary, treat again with a further 10-15g (1- 1½ CP) carbohydrate.

My preferred option for hypo treatment is ……..

Help from Others

Any of the above treatments can be given if you are able to swallow.

In severe hypos you may be unconscious, in which case your family and friends may be taught how to give you a glucagon injection.

The role of glucagon

Glucagon is a natural hormone made in the pancreas. It raises blood glucose levels by releasing stores of glucose from the liver (glycogen). It is produced when blood glucose levels fall and can also be given by injection. The injection is called GlucaGen.

What do you need to do when you have regained consciousness after a glucagon injection?

It is recommended that you replenish your liver stores of glucose by having a carbohydrate-rich food or drink.

There will be an opportunity to discuss this in your group

Illness and Diabetic Ketoacidosis (DKA)

Think back to the section on ‘What is diabetes?’

What would happen if you stopped your insulin injections?

What symptoms do you experience when your blood glucose levels are high?

What are some of the reasons for high blood glucose levels?
Symptoms of high blood glucose levels (hyperglycaemia) may include:

- Passing lots of urine
- Thirst
- Weakness
- Blurred vision
- Abdominal pain
- Leg cramps
- Nausea and vomiting

Possible causes:

- Illness
- Infection
- Stress
- Hormonal
- Steroids
- Insulin degradation (inadvertent freezing, out of date etc.)

Managing illness

When you are ill, your body becomes more resistant to the insulin you are taking so you will always require more. In addition, you will produce stress hormones that will cause your glucose levels to rise.

Think back to times when you have been ill.

What were the causes?How did you manage it?

Implications of ketone levels

In the absence of sufficient insulin, the body's cells cannot use glucose for energy. The cells will switch to an alternative energy source and body fat will be broken down to supply the necessary energy.

This rapid breakdown of fat can cause the build-up of substances known as ketones. Eventually, the blood glucose and ketones rise to levels that cause the blood to become acidic and this is known as diabetic ketoacidosis (DKA). The only treatment for DKA is insulin and fluids.

Ketones can be measured in urine by Ketostix or in blood by using a MediSense Optium meter. It is advisable to check the expiry date on urine and blood strips before use.

There may be an opportunity to discuss this in your group

As DKA can develop and progress quickly and makes you feel very unwell, the next section gives guidelines for you to follow if you are ill.

What should I do if I'm ill and my blood glucose levels are high?

It is recommended that you test your blood or urine for ketones if your blood glucose levels are over 14 mmol/l.

What should I do if I have a positive ketone test?

- You should take some rapid acting insulin as soon as you can. Take **double** your correction dose

My **doubled** correction dose is:

2 units of rapid-acting insulin will lower blood glucose by ……. mmols

- Drink plenty of water and sugar-free fluids
- Test blood glucose every 1-2 hours and repeat the above dose until blood/urine is negative to ketones
- Try to identify cause of high blood glucose level and seek treatment if necessary
- Contact diabetes team if high glucose and ketones levels persist
- Contact GP/ Accident and Emergency Dept if you are vomiting as dehydration may occur
- Continue with usual amount of background insulin

What should I do if I'm ill and my blood glucose levels are high but I do not have ketones?

- You should continue to test for ketones every 1-2 hours if your blood glucose levels remain above 14 mmol/l. If you have a positive ketone test, treat as above
- If your ketone test is negative, but your blood glucose levels remain above 14 mmol/l, take your **usual** correction dose

My **usual** correction dose is:
1 unit of rapid-acting insulin will lower blood glucose by ……mmols

- Drink plenty of water and sugar-free fluids
- Try to identify cause of high blood glucose level and seek treatment if necessary
- Continue with usual amount of background insulin

Some safety advice for illness

- Always continue taking your insulin, even if you're not eating
- Test for ketones if your blood glucose levels are above 14 mmol/l
- Positive ketone tests always require treatment
- If you are unable to eat because you are ill, you can obtain carbohydrate from sources such as Lucozade, fizzy soft drinks, squashes and milky drinks

Think back again to times when you have been ill

Would you manage it differently now?

What would you do now?

Now I'm counting carbohydrate can I eat what I want?

You now have the choice to eat as much or as little as you please. Eating more calories (energy) than your body requires will cause weight gain. You also have the option of choosing a healthy diet.

So what is a healthy diet?

A healthy diet consists of foods that are low in animal fats, high in fibre and low in sugar with plenty of fruit and vegetables. Cutting down on salt and eating more oily fish is also a healthy option.

What are the advantages of a healthy diet?

Eating healthily reduces the risk of weight gain, coronary heart disease, stroke and some cancers. Other risk factors such as high blood pressure and high cholesterol levels can also be reduced by healthy eating.

Which foods will affect my cholesterol levels?

There are two different types of cholesterol: HDL (high density lipoprotein or "good cholesterol") and LDL (low density lipoprotein or "bad cholesterol"). You should aim to have a higher HDL and a lower LDL cholesterol. This can be achieved by reducing the amount of saturated fat that you eat. Saturated fat is found in animal products e.g. fat on meat, cheese, butter, lard and dripping.

So how can I cut down on the amount of saturated fat I eat?

- Try to grill, bake, microwave or casserole rather than fry foods
- Choose the leanest meat and cut fat off before cooking. Substitute fish and poultry (without the skin) for fatty red meats and meat products like pies, pasties, sausages and pate
- Choose semi-skimmed or skimmed milk
- Use alternatives to cream such as low fat yogurt or fromage frais
- Cheese is high in fat. Choose lower fat cheeses such as Edam, Mozzarella or half-fat hard cheese. Cottage cheese is low in fat
- Substitute fruit or low-fat alternatives for snacks like crisps, nuts, biscuits and chocolate

- Use low fat spreads instead of butter. Choose a monounsaturated oil eg rapeseed or olive for cooking instead of lard or dripping
- Choose low fat salad creams, mayonnaise and salad dressings

I've heard sardines are good for me, is it true?

Sardines are oily fish as are mackerel, pilchards, trout, salmon and fresh tuna. They contain Omega 3 fatty acids. Having 1-2 portions of oily fish each week can help prevent heart disease.

In the fruit and veg section of the supermarket I've seen a sign saying '5-a-day'. What does this mean?

This sign supports the current advice to eat 5 portions of fruit and veg each day. One portion of fruit or vegetables is:

- 1 apple, orange, pear, peach, nectarine, banana
- 2 plums, apricots, tangerines
- 1 small handful of dried fruit
- 1 small glass of fruit juice
- 1 cupful of grapes, cherries or berries
- 2-3 tablespoons of vegetables, raw or cooked
- large portion of salad (as a main course)

Try to choose 5 portions come from a variety of different fruits and vegetables. Any increase in the amount of fruit and veg you eat will help. If you're hungry between meals, fruit makes a good snack.

The other thing mentioned was blood pressure. How is that affected by what I eat?

A high salt intake can increase blood pressure in some people. If you are overweight, losing weight can help to reduce your blood pressure.

How can I reduce my salt intake?

You can reduce the amount of salt you eat by avoiding both salt in cooking and salt added at the table.
Commonplace foods high in salt are bacon, ham, crisps, salted nuts and cheese and processed foods. Cutting down on these foods will help reduce your salt intake.

How can I keep my weight within the normal range?

If you eat and drink more energy (calories) than you use you will gain weight. Weight gain or loss is determined by balancing food and physical activity. Less food and more physical activity aids weight loss.

So how do I lose weight if I want to?

You can try to reduce the amount of energy-dense foods that you eat. Examples of these foods include those that are high in fat or sugar (biscuits, cakes, chocolate, savoury snacks, fried foods). Increasing the amount of fruit and vegetables you eat can help to fill you up. If you feel you need more individual advice, contact your diabetes team for advice.

Do you have a target weight?

When you have completed your course, the skills you have developed will give you the opportunity to make informed choices about what you eat and the physical activity you take.

Is there anything else you have heard about diet that you would like to discuss in your group?

Alcohol

The amount of carbohydrate in alcoholic drinks can vary greatly. Some alcoholic drinks contain little or no carbohydrate (dry wines, spirits), some contain moderate amounts (beer, lager, cider) and some contain significant amounts (alcopops, sweet sherry and wines, port). The effect of this on blood glucose levels will depend upon the amount and the type of alcohol drunk.

Alcohol itself, in large amounts can increase the risk of hypoglycaemia. This is because alcohol is processed by the liver and interferes with the normal process of glucose release by the liver if blood glucose levels fall. This effect of alcohol can last for up to twenty four hours.

To help avoid this:

- Eat some starchy carbohydrate foods before or with alcoholic drinks. You may need a snack before bed after drinking alcohol in the evening
- Try to avoid drinking on an empty stomach
- Some people do not count the carbohydrate in alcohol at all and some people adjust the amount of insulin they inject. You will discuss this more fully in your group
- Monitor blood glucose levels closely and take into account the effect of food and exercise/activity which you take around the time you are drinking.

Recommended amounts

The government gives advice on the amount of alcohol that should be drunk. Alcohol is measured in units. 1 unit is found in:

½ pint beer, cider, lager (3-4% abv)
remember strong beer and lager and vintage cider can contain twice the amount of alcohol

125ml glass of wine (9%abv)
most wines contain 12-14% alcohol and a glass of these provides 1½ units alcohol

1 pub measure (25mls) of spirit (40% abv)

It is recommended that women should drink no more than two units each day and men no more than three units each day with 2-3 alcohol-free days each week.(abv = alcohol by volume)

The table below shows the carbohydrate content of some common drinks.

Type of drink with standard serving size	CP per drink	Alcohol units per drink
Gin, Bacardi 50 ml double (40% abv) with slimline mixer	0	2 units
Cognac 50 ml double (40% abv)	0	2 units
Pilsner beer 330ml bottle (5%abv)	0	2 units
White wine 175ml regular glass (12.5%abv)	½ CP	2 units
Red wine 250 ml large glass (15% abv)	½ CP	4 units
Port, Sherry, Vermouth 50ml glass (15-20%)	½ CP	1 unit
Beer 1 pint (3 - 4% abv)	1 CP	2 units
Lager 330 ml bottle (5%)	1 CP	2 units
Liqueur (Baileys Irish cream, Tia Maria) 50ml	1½ CP	1 unit
Stout (Guinness) 1 pint (4% abv)	1½ CP	2 units
Cider 1 pint (5% abv)	2 CP	2½ units
Bacardi Breezer, Smirnoff Ice 275ml bottle (5%abv)	2½-3 CP	1½ unit
Double Vodka Red Bull	2½ CP	2 units
Vintage Cider 500ml bottle (8%abv)	4 CP	4 units
Low alcohol beer 330ml bottle (less than 1%abv)	2CP	trace
Low alcohol wine 175 ml glass (less than 1%abv)	2CP	trace
Cola, Lemonade, Fruit juice 150ml as mixer	1½ CP	0
Red Bull 200ml can	2½ CP	0
J20 330ml bottle	3½CP	0
Mineral water, soda water, slimline or diet drinks	0	0

Have a look at the table above. What effect do you think one glass of dry sherry would have on your blood glucose levels compared to a bottle of alcopop like Bacardi Breezer?

If you decide to have a glass of red wine with dinner, would you need to take any extra insulin?

A rugby player goes for a night out with his friends and drinks 5 pints of bitter. What might happen to his blood glucose levels? Would this have any effect the next day?

Exercise

People with diabetes are often encouraged to take exercise.

What are the benefits of exercise?

Regular exercise can:

- Improve general health and well-being
- Help control body weight
- Provide enjoyment

How can I find out how exercise affects me?

Understanding what happens to your body during exercise will help you to manage this more effectively by avoiding hypoglycaemia (hypos), maintaining blood glucose levels and improving performance.

Planning ahead for exercise can help reduce the risk of hypoglycaemia and testing blood glucose levels before, during and after exercise can provide information about your body's response to exercise. You may find that your insulin doses and your food intake may need some alteration.

What affects blood glucose levels during exercise?

High blood glucose levels may be caused by the following:

- If there is a shortage of insulin, glucose cannot enter the muscle cells and the blood glucose level will rise.
- The body recognises an increased need for glucose to provide energy and will release glucose from the liver stores.

Low blood glucose levels may be caused by the following:

- Glucose is used by the muscles to provide energy during exercise and this causes blood glucose levels to fall.
- Insulin may be absorbed more quickly than usual from the injection site if the blood supply to that area is increased by exercise.

Why can hypos be more difficult to detect during exercise?

Many of the recognised symptoms of a hypo are often experienced during normal exercise, for instance, feeling hot or sweaty and noticing an increased heart rate. Checking your blood glucose will help you to make the necessary adjustments. A previous hypo during the last 24 hours may increase your risk of further hypos and this risk is further increased by exercise.

More detailed information about changes to insulin and carbohydrate intake to prevent hypos can be found in Appendix 4.

What exercise should I choose?

Whilst any exercise is beneficial, you should choose an activity that best meets your goals and is safe for you to do. There are two types of exercise; aerobic and anaerobic.

What is aerobic exercise?

During aerobic exercise, plenty of oxygen is available to the muscles, allowing them to use glucose and fats completely to provide energy. Examples of aerobic activity are running, jogging, using a treadmill or rowing machine and cycling. Prolonged aerobic activity at low intensity is best for weight control.

What is anaerobic exercise?

Anaerobic exercise starts when there is not enough oxygen supplied to the muscles. Typically, anaerobic exercise occurs when you do short bursts of intense activity such as sprinting or weight training. You may find that you do not need to take extra glucose nor reduce your insulin dose for this type of exercise.

Is it safe for me to exercise?

Exercise is vital to staying fit and healthy. Before starting a new exercise regimen, you may wish to discuss insulin adjustment with your diabetes team. This will be particularly important if you have complications of diabetes that affect your feet, heart, eyes or blood pressure.

Psychological Issues and Diabetes

Living with diabetes requires juggling diabetes management alongside normal everyday life. Demands are made from many sources such as family, friends and work. Taking into account the management of diabetes in addition to everything else can sometimes seem overwhelming or frustrating and your own needs can easily slip down the list of priorities. Living with diabetes can be challenging and you may find there are times when you feel frustrated, angry, overwhelmed or discouraged.

The demands of managing diabetes can influence your mood and your outlook; conversely other aspects of your life can influence how you feel about your diabetes. Either way the management of your diabetes may be affected as a result. If you feel you would like to discuss your feelings, you may find it helpful to talk about this with a member of your diabetes team. Occasionally it may be appropriate for you to be referred to a member of the healthcare team with specialist knowledge of psychological issues and diabetes.

You may have an opportunity to discuss this further in your group

Complications of diabetes

Complications are associated with having high blood glucose levels over a number of years and this can lead to changes and damage in certain parts of the body. Short periods of high blood glucose levels will not seriously damage the body's tissues. The areas most commonly affected by complications are:

- eyes (retinopathy)
- kidneys (nephropathy or renal disease)
- nerve tissue (neuropathy)
- blood vessels in the heart (cardiovascular disease)

Other risk factors for complications include high blood pressure and high cholesterol (a fat in the blood).

Will I definitely get complications?

This is a difficult question to answer. Medical studies have shown that, in most cases, the risk of developing complications can be reduced by maintaining blood glucose levels as near to the normal range as possible.

What can I do to reduce my risk?

Maintaining your blood glucose levels as near to the normal range as possible should help to reduce your risk. Other risk factors like high blood pressure and cholesterol levels can be managed by either lifestyle or drug treatment.

Regular check-ups will help to identify and treat any complications at an early stage.

You may have an opportunity to discuss the evidence from studies further in your group

What problems could I have with my eyes?

The main problem is retinopathy. This is damage to the tiny blood vessels in the membrane at the back of the eye (the retina). These changes, if left untreated, can lead to formation of new blood vessels. These blood vessels are more fragile and may bleed easily. Bleeding in the eye can lead to loss of sight. National recommendations advise you to have your eyes checked by retinal screening every year as the treatment is very effective.

What are the common treatments for retinopathy?

Laser treatment is the commonest treatment for retinopathy and is highly effective. It consists of a number of tiny laser beams being shone through the pupil (the black part of the eye) directly onto the retina. This reduces the risk of bleeding and of loss of sight. This treatment is often given in an outpatient clinic and is not normally painful, although it is described as a strange sensation.

What about cataracts?

Cataracts cause frosting of the lens of the eye and result in blurring of vision and haziness around bright lights. A cataract will also make eye screening difficult, as it will be difficult to see the retina. If necessary, the lens can be replaced and this is usually performed under local anaesthetic.

What problems can I get with my kidneys?

The kidneys can be affected by nephropathy. This is damage to the blood vessels in the kidney and they can become thickened and cause irregular filtering of the blood. The first sign of nephropathy is leakage of very small amounts of protein (microalbuminuria) into the urine. Urine can be tested for the presence of albumin.

What treatment is available?

Early nephropathy is usually treated by a tablet called an ACE inhibitor and by blood pressure control.

Why do I have to take extra care of my feet ?

Diabetes can lead to reduced sensation in your feet. This loss of sensation is caused by damage to the nerve tissue (neuropathy) or poor circulation. If there is loss of sensation in your feet, you may not be aware of cuts or damage caused by pressure from footwear.

How can I tell if there are problems with my feet?

Symptoms of neuropathy include pins and needles, a tingling sensation, numbness or pain. The sensation in your feet should be checked at your annual review.

What can I do?

Examining your feet regularly can help spot changes at an early stage. Ensuring that your footwear fits correctly and that you are always wearing something on your feet helps prevent accidental injury. If you develop nerve damage in your feet, treatment is available.

Am I more likely to have a heart attack or stroke and how can I help to prevent this?

This is a difficult question to answer and depends upon other risk factors like high blood pressure, high blood cholesterol, smoking, obesity, lack of physical activity and a family history of heart disease. If you have any of these added risk factors you may wish to discuss future management of your diabetes with your diabetes team.

Why are some people on cholesterol tablets?

Reducing cholesterol levels helps reduce the risk of heart disease. Blood cholesterol levels can be reduced by making changes to the kind of fat you eat and by losing weight if you are overweight. There is more information about cholesterol and reducing the amount of fat you eat in the healthy eating section of this booklet.
Cholesterol tablets are known as statins and are usually prescribed if levels remain high after lifestyle change.

Are there any more questions about complications you would like to discuss in your group or with a member of your diabetes team?

Annual Review

Your annual review is a chance for you to discuss your diabetes management and provides screening for complications. Information should be available about the function of your eyes, kidneys and feet and you should be tested for long-term blood glucose control (HbA1c), cholesterol and blood pressure.

You may wish to keep a record of your latest results and dates of review and the form on the next page may be helpful. You may wish to photocopy this form and keep it for your future appointments.

Are there any results you would like to discuss with a member of your diabetes team?

Annual review – my results

Date of annual review ……..

Test	Date	Target	Result	Comment
HbA1c				
Blood pressure				
Cholesterol				
HDL cholesterol				
LDL cholesterol				
Microalbumin				
Retinal Screening				

Date of my next annual review ……
You may wish to photocopy this page and use it for future appointments

Comments and Suggestions

We would be really grateful if you would complete this form and send it back in the enclosed envelope. Your comments are very valuable to us and they will enable us to improve this booklet.

Please consider the following four questions

How useful was the booklet? (Please tick the statement you agree with)

1	**2**	**3**	**4**
not at all useful	not useful	useful	very useful

Any other comments?

How appropriate were the questions? (Please tick the statement you agree with)

1	**2**	**3**	**4**
very inappropriate	inappropriate	appropriate	very appropriate

Any other comments?

Is there anything else you would have liked included?

Have you any further comments or suggestions?

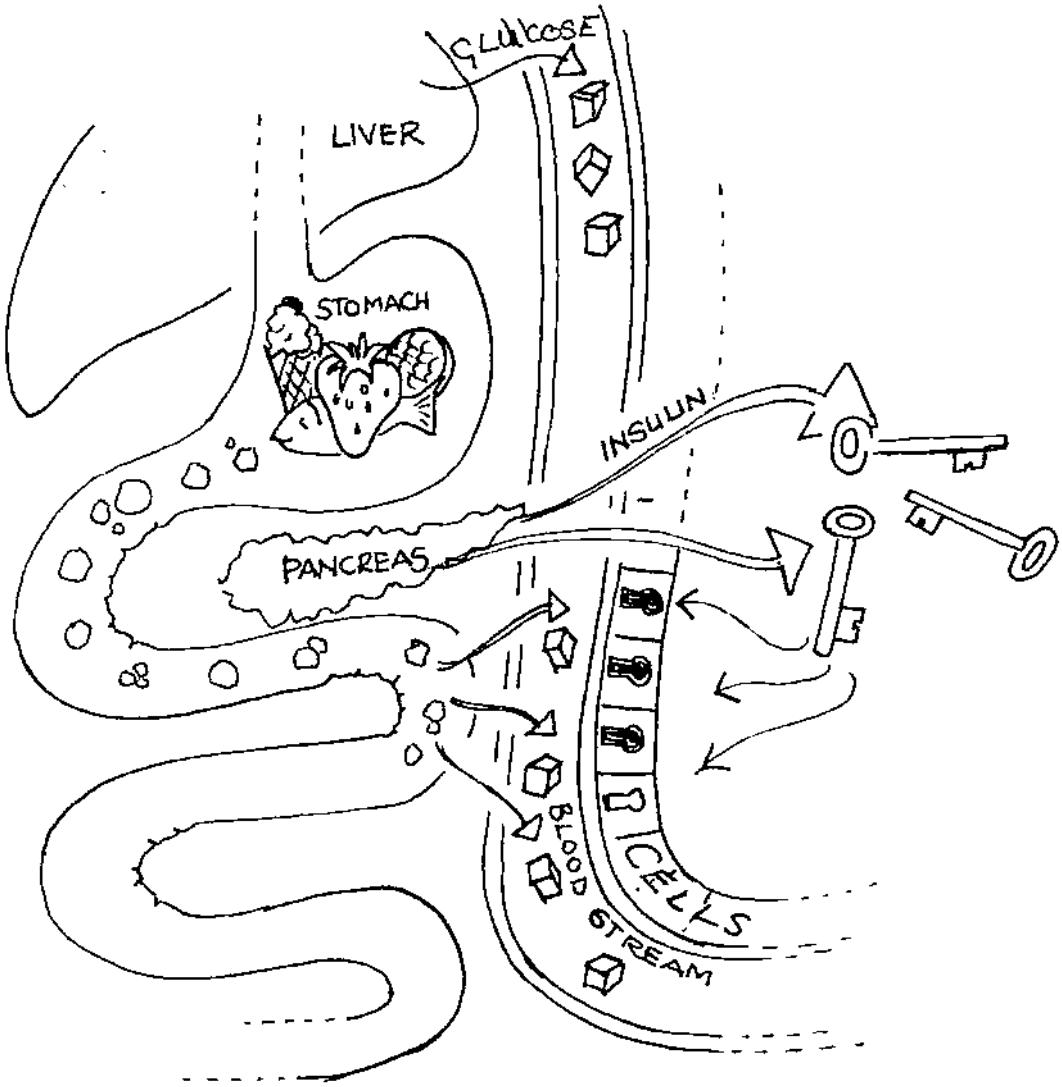
Please use overleaf if you have more to write.

Thank you from the Type 1 Learning Programme Collaboration Team for spending your time to complete this form. Please return it to your diabetes team.

Appendices

Appendix 1

Diagram of insulin action in the body



You may have an opportunity to discuss this diagram of the action of food and insulin in your group

Appendix 2

Carbohyhdrate counting – more practice

Exercise 1
Identify the foods containing carbohydrate

Exercise 2
Work out the amount of carbohydrate or the CP value for these foods

Exercise 3
Calculate the amount of insulin you would take with these meals

Tb = tablespoon
tsp = teaspoon
Tbsp = tablespoon

Menu 1

Breakfast
2 fried eggs
1 slice of lean back bacon
1 grilled tomato
2 slices of thick wholemeal toast
margarine
2 heaped tsp Jam

Lunch
250g baked jacket potato
teaspoon butter
½ can (212g) baked beans
125ml low fat fruit yoghurt

Snack
1 digestive biscuit
large green apple

Dinner
8oz grilled rump steak
150g chips
fried mushrooms
1 Tbsp peas
small side salad
2 scoops (120g)vanilla ice cream
2 pints lager

Menu 2

Breakfast
bowl of muesli (60g, 4tbsp)
semi skimmed milk (125g)
150mls fresh orange juice

Lunch
ham baguette
(approx. 5inches long)
packet crisps
can of diet lemonade

Snack
Hot buttered teacake

Dinner
225g cooked spaghetti
150g bolognese sauce (minced beef)
2 cream crackers
stilton and cheddar cheese
stick of celery
2 glasses red wine

Menu 3

Breakfast
2 croissants
3 tsp marmalade
½ fresh grapefruit
cup of tea, no sugar

Lunch
McDonalds Big Mac
medium French fries
large diet coke

Snack
Large banana

Dinner
Roast chicken (120g)
gravy
roast potatoes (4 small, 160g)
medium roast parsnip (90g)
2 broccoli florets
1 Tbsp carrots
medium bowl, 150g rice pudding
2 glasses dry white wine

Menu items containing carbohydrate to count	Carbohydrate content (g)	CPs
Menu 1		
Breakfast		
2 slices of thick wholemeal toast	40	4
2 heaped tsp jam	20	2
Lunch		
250g baked jacket potato	79	8
½ can (212g) baked beans	32	3
125ml low fat fruit yoghurt	22	2
Snack		
1 digestive biscuit	9	1
large green apple	20	2
Dinner		
150g chips	45	4½
2 scoops (120g)vanilla ice cream	28	3
2 pints lager	(40)	(4)
Menu 2		
Breakfast		
bowl of muesli (60g, 4tbsp)	40	4
semi skimmed milk (125g)	6	½
150mls fresh orange juice	13	1½
Lunch		
ham baguette (approx. 5inches long)	50	5
packet crisps	15	1½
Snack		
teacake	30	3
Dinner		
225g cooked spaghetti	50	5
2 cream crackers	10	1

Menu 3		
Breakfast	45	4½
2 croissants	15	1½
3 level tsp marmalade	5	½
½ fresh grapefruit		
Lunch	44	4½
McDonalds Big Mac	28	3
medium French fries		
Snack	40	4
Large banana		
Dinner		
roast potatoes (4 small, 160g)	40	4
medium roast parsnip (90g)	11	1
medium bowl, 150g rice pudding	21	2

Appendix 3

Checking insulin ratios

Following your course, you may find that you may need to adjust your insulin ratios or your background insulin to achieve your personal targets. It is recommended that you look for patterns that occur over a period of time and try not to react to one-off blood glucose readings.

Identifying patterns takes some practice and there are some examples below that you may find helpful. Our suggestions can be found at the end of this section.

Example 1

Katy takes I unit for every 10g carbohydrate (1CP) she eats. Here are her blood glucose readings over a couple of days

Time	Blood glucose	Amount of carbs	Insulin for food	Correction dose	Comments
Day 1					
0730	7.2	40g (4CP)	4		Normal day
1030	3.2				Felt hypo
1330	5.2	50g (5CP)	5		
1800	6.7	60g (6CP)	6		
2200					
Day 2					
0730	6.5	40g (4CP)	4		Normal day
1030	3.0				Felt hypo
1330	6.2	40g (4CP)	4		
1800	7.1	70g (7CP)	7		
2200					

- What pattern have you identified?
- Which options have you considered?
- What changes would you make?

Example 2

Charlie takes I unit for every 10g carbohydrate (1CP) he eats. Here are his blood glucose readings over a couple of days.

Time	Blood glucose	Amount of carbs	Insulin for food	Correction dose	Comments
Day 1					
0730	5.7	60g (6CP)	6		Normal day
1030					
1330	11.2	50g (5CP)	5	2	
1800	6.5	70g (7CP)	7		
2200	8.9				
Day 2					
0730	6.8	60g (6CP)	6		
1030					
1330	12.3	50g (5CP)	5	2	
1800	7.1	90g (9CP)	9		
2200					

- What pattern have you identified?
- Which options have you considered?
- What changes would you make?

Example 3

Mandy takes 24 units of background (Lantus or Levemir) insulin and she takes 1 unit of insulin for 10g carbohydrate (1 CP) she eats.

Time	Blood glucose	Amount of carbs	Insulin for food	Correction dose	Comments
Day 1					
0730	12.0	40g (4CP)	4	2	
1030					
1330	8.2	50g (5CP)	5		
1800	7.2	60g (6CP)	6		
2200	8.1				
Day 2					
0730	11.8	40g (4CP)	4	2	
1030					
1330	7.8	50g (5CP)	5		
1800	6.9	60g (6CP)	6		
2200	8.8				

- What pattern have you identified?
- Which options have you considered?
- What changes would you make?

Our suggestions

Example 1 – Katy

What pattern have you identified?

Katy has a low blood glucose mid-morning, after breakfast. This may suggest that she is taking too much insulin with her breakfast or that the carbohydrate counting may not be accurate.

Which options have you considered?

There are probably three options here. One is to re-check the carbohydrate content of breakfast, another is to eat a snack mid-morning without taking any insulin. Finally, you could reduce the amount of insulin taken with breakfast by changing the ratio. It is usually recommended that you make small changes and then re-assess. For example, here you may reduce the insulin to 0.75 units per 10g carbohydrate, which would mean taking 3 units with breakfast.

What changes would you make?

This decision depends upon whether you wish to eat a snack mid-morning or not.

Example 2 - Charlie

What pattern have you identified?

Charlie has a high blood glucose level before lunch. This may suggest that he is taking too little insulin with his breakfast.

Which options have you considered?

There is probably only one option here. Charlie could take more insulin with his breakfast be changing his ratio. It is usually recommended that you make small changes and then re-assess. For example, here you may increase the insulin to 1.25 units per 10g carbohydrate, which would mean taking 5 units with breakfast.

What changes would you make?

Increase the ratio and then re-assess as you may need to make a further change.

Katy and Charlie are both examples of cases where adjustment to the insulin to carbohydrate ratio at breakfast is necessary. For the remainder of the time, their blood glucose values are usually within target and no further adjustments are necessary.

Example 3 – Mandy

What pattern have you identified?

Mandy has a high blood glucose level on waking. This may suggest that she is taking too little background insulin.

Which options have you considered?

There is probably only one option here. Mandy could increase her background insulin to reduce her morning blood glucose level. It is usually recommended that you make small changes and then re-assess. Mandy could increase her background insulin by 2 units (as this is approximately 10% of her dose, it would be safe).

What changes would you make?

Increase the background insulin and re-assess in three days. You may consider contacting your diabetes team to discuss this further.

Mandy's dairy shows an example of a situation where adjustments to background insulin is necessary.

Appendix 4

Insulin – injection sites and storage

Injection sites

There are 3 main areas you can use to inject insulin:

- Abdomen
- Thighs
- Buttocks

The absorption varies from one site to another and you will discuss this further in your group. If you use the same place to inject your insulin, you may find that you develop lumpy tissue and this will affect the rate at which your insulin is absorbed. It is a good idea to rotate your sites.

- Where do you usually inject your insulin?
- Can you feel any lumps?
- Can you think of any other sites to inject?
- What angle do you hold your injection pen/syringe?
- Do you fold up some skin to inject into?

Storage

You can keep the insulin you are using at room temperature for about 1 month before its activity is affected. All spare insulin not in current use should be kept in a fridge. It is a good idea to check the expiry date on your insulin before you use it.

Appendix 5

Exercise and insulin adjustment

To minimise the risk of hypoglycaemia you may wish to try the following suggestions:

- Reduce overnight insulin dose before prolonged morning exercise.

- Reduce pre-exercise bolus insulin doses :

    - If the exercise is at moderate intensity for 30 minutes, reduce the pre-exercise meal-related bolus dose by 25%
    - If the exercise is at moderate intensity for 60 minutes, reduce the pre-exercise meal-related bolus dose by 50%
    - If the exercise is at high intensity for 60 minutes, reduce the pre-exercise meal-related bolus dose by 75%
    - If the exercise is at high intensity for more than 60 minutes, have no pre-exercise meal-related bolus dose, and take extra glucose after the first 30 minutes

- You may need a supply of extra glucose during extended exercise. Taking an extra 30-60g CHO for each hour of exercise can help prevent hypos.

- Some people find they may need to adjust their basal dose of insulin following exercise.