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DIABETIC PATIENT EDUCATION AND MOTIVATION

VOLUME 2

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INTRODUCTION

Volume 2 comprises the thesis supplement which contains the Diabetes Educational/Motivational programme (DE/MP) used in the study 'Diabetic Patient Education and Motivation' as documented in Volume 1. This supplement describes the educational methods used, and the motivational techniques and behavioural strategies adopted. A teaching plan is given for each session, and appear in the order in which they were presented. The plans aim to provide a detailed account of the content of each session and the nature of the information presented. The learning and visual aids used are also illustrated.

SESSION NUMBER: 1

Topic: INTRODUCING DIABETES

Time: 1 hour

Format: Group - 3 to 7 patients

Resources:

Teaching model of the human anatomy

Slides - introducing diabetes

Diabetes educational books - Wise PH, Knowing about Diabetes

(W. Foulsham & Co. Ltd., London).

British Diabetic Association membership forms

Aims:

To describe diabetes and how it affects the body, and to explain the aims of insulin treatment.

To introduce group members to each other and to create a relaxed atmosphere, conducive to learning and to patient expression of their personal feelings and emotions about diabetes.

Objectives:

That the patient will be able to:

1. Describe why the body requires carbohydrate.
2. State briefly the function of insulin and the consequences of insulin deficiency.
3. Indicate which part of the body produces insulin.
4. Describe what is meant by 'diabetic control'.

5. Develop a preliminary appreciation for the purpose of insulin treatment.
6. Distinguish the main differences between type 1 and type 2 diabetes.
7. State some 'possible' causes of type 1 diabetes.
8. Explain the major differences in the risks of inheriting diabetes with insulin-dependent and non-insulin-dependent types.
9. Openly express feelings of anger, frustration or depression related to diabetes, so that these may be considered during subsequent sessions.
10. Communicate with the educator and other group members.

STRUCTURE OF PRESENTATION

Transition:

5-10 minutes were spent in a 'question and answer' session in which the transition from the previous teaching session to the present session was made. This provided an opportunity for 'recall' of information already learnt and established the level of patient knowledge concerning the topic to be discussed.

In the first session questions were intended to promote discussion and encourage patients to reveal information about themselves in relation to their diabetes. Sample questions are shown below:

1. How long have you had diabetes?
2. How often do you attend the diabetic clinic?
3. Has anyone had any formal instruction about diabetes?
4. Is anyone a member of the British Diabetic Association?
5. Do you feel there is more to know about your diabetes?

Content:

Patients were informed of the content of the current session so that they could anticipate the format of the session.

Initially patients were presented with the concept that food contains carbohydrate which provides an important source of energy within the body. Slides were used to illustrate the fate of dietary carbohydrate, in terms of its conversion to glucose and subsequent transportation to the liver and muscle cells (Fig. S2).

In order to explain the function of insulin, the basic metabolism of the non-diabetic was considered. A comparison was made between a non-diabetic person and an insulin-dependent diabetic person, and the consequence of insulin deficiency was discussed amongst the group.

With reference to a model displaying the major organs of the body (Fig. S1), the size and position of the pancreas gland was illustrated using slides.

The concept of 'diabetic control' was described in terms of 'what is considered as good diabetic control' and the aims of achieving blood glucose levels as near to the normal range as possible were stated.

The historical aspects of insulin discovery were briefly outlined, emphasising the 'life-saving' feature of insulin to promote appreciation of the current therapy, despite restrictions imposed.

The difference between type 1 and type 2 diabetes was explained, with respect to treatment, age, aetiology and inheritance.

Current thoughts on the aetiology of insulin-dependent diabetes (IDD) was presented to the patients in simple terms.

The inheritance of IDD was discussed with reference to a typical family history case where there is a child with an IDD mother and non-diabetic father. The relatively low risk of inheritance, compared to many other inherited diseases, was emphasised and reassurance given.

Expression of personal feelings was encouraged by approaching different members of the group concerning their experiences at diagnosis and to what extent they thought that diabetes had affected their lives.

This provided stimulus for discussion amongst the groups of IDD patients meeting for the first time.

Summary:

The information was summarised by verbally reviewing the key facts presented in the session using a series of statements listed below. This provides 'reinforcement' of the learning process and encourages 'recall' of the most relevant information at a later date.

1. To obtain energy from the food we eat we need insulin.
2. Diabetes (mellitus) occurs when there is not enough or no insulin.
3. Diabetes can be controlled with insulin and diet, tablets and diet or diet alone.
4. Prior to the discovery of insulin people died due to diabetes.
5. Insulin-dependent diabetes is not strongly inherited, but NID is strongly inherited.
6. The onset of diabetes may be related to a viral infection or damage to the insulin producing cells by the body's defence system.

Discussion:

Several open-ended questions were asked to the group, these were intended to encourage self-expression and discussion:

1. How did you feel when you first became diabetic?
2. Is there anyone else in your family who has diabetes?
3. Do you feel that you have a disadvantage in life because of your diabetes?
4. What do you dislike most about having diabetes?

Motivational Aspects:

Patients were made to feel that they had a 'right' to this educational service and that their wellbeing is important.

Each patient was provided with a copy of the diabetes educational book 'Knowing your Diabetes' (Ed. PH Wise).

Patients were provided with a free one year membership of the BDA.

Arrangements were made to ensure that subsequent sessions could be held at convenient dates and times for each patient group (including Saturdays and evenings).

Evaluation: Based on all groups who participated.

Most patients were very eager to relate their own personal experiences and were happy to share thoughts with other diabetic people because they thought 'they would understand'. Some patients appeared puzzled that someone should be taking such interest in their diabetes and wellbeing. All groups agreed that there were areas of diabetes they

wished to know more about and the general opinion was that there was a need for some diabetes education. One patient asked 'why do they keep diabetes such a big secret?', indicating that some patients actually perceived their own lack of understanding of some aspects of diabetes.

In general, the level of patient participation was good, although communication proved more difficult with particular patient groups, e.g. all male groups tended to be less expressive about emotions/feelings concerning diabetes.

Resources enhanced stimulus variation and the anatomical model provided a source of humour.

Approximately 10-15% of the patients were members of the British Diabetic Association, all non-members were provided with a free 1 year membership.

INTRODUCING DIABETES: - Script

Note: Slides used in the session are illustrated in Figs. S2 and S3 following the script shown here.

1. Introduction

Energy is provided from the food we eat, and the first type of food to give energy to us is carbohydrates, but to use carbohydrates as energy we need insulin.

2. What is insulin?

Insulin is a hormone (or substance) which is produced in the pancreas. This is an organ of your body which lies just below the stomach (illustrate with model - Fig. S1).

3. What happens to carbohydrates in the non-diabetic person?

The carbohydrates such as bread, potatoes, rice, cakes and biscuits are digested here in the stomach (illustrate - Fig. S1). They are broken down to very small pieces and eventually they become very small particles which are chemically changed to sugar by juices in your stomach - we call this sugar glucose. This leaves the stomach and travels in these blood vessels (illustrate - Fig. S1). Now the blood sugar or blood glucose has increased and the pancreas secretes insulin into the blood. The insulin now comes along in the blood and helps to move the sugar out and into the muscles which gives you energy, or into the liver and other organs of your body, and it can be stored up and used later. When no carbohydrate is eaten and therefore no extra glucose appears in the blood, insulin switches off, and the glucose level in the blood is kept between 3.5-8.0.

4. What happens in the diabetic person?

Just the same as in the non-diabetic person the carbohydrates we eat are broken down to glucose and enters the blood, but this time there is no insulin, or not enough insulin, and the glucose cannot be carried off out of the blood into the muscles or organs in the body. The body will have no energy and no stored sugar for later.

5. What happens to the extra glucose?

The glucose stays in the blood and reaches high levels. The blood cannot cope with a large amount of glucose and the body's filtering system - the kidneys - try to clean the blood by filtering out the extra glucose. The blood is like a 'dam system', once the glucose reaches high levels (above 10 $\mu\text{mol/l}$), the dam breaks and the glucose will spill over into the urine.

Signs that your diabetes is out of control include:

- (a) Tiredness and lack of energy.
- (b) Thirst
- (c) Passing more urine
- (d) Glucose in the urine.

6. History of Diabetes

Before insulin was discovered, diabetic patients had to try very hard to stay alive by keeping to very strict diets - in fact they were almost starvation diets - but most people eventually died. Diabetes in those days was a 'killer' and we are certainly lucky to have insulin treatment.

In 1922 two doctors called Banting and Best discovered that diabetes was due to a lack of insulin, and they found this out by doing experiments. They made a dog diabetic by taking out the pancreas and then injected insulin back into the dog. They found that the dog remained well if insulin was injected and the blood glucose decreased. They then tried this treatment with humans - in 1922 beef insulin was injected into a diabetic man for the first time. This became the treatment for diabetes and still is today.

Since then we have gone on to use pork insulins also and there are many different types available.

7. Types of Diabetes

There are two types of diabetes - insulin-dependent and non-insulin-dependent.

Non-insulin-Dependent

There is still some insulin being produced, but it does not work properly or it may be that not enough insulin is produced to cope with the glucose in the blood. In this case the person may need a 'sugar free' diet with or without tablets. This type of diabetes is more common and appears in older people. Often they tend to be overweight.

Insulin-Dependent

This is where there is very little or no insulin and you will need to inject the insulin. Usually younger people have this type and tend to lose weight when they first become diabetic. Less common than NIDD.

8. Do the tablets for diabetes contain insulin?

No. These tablets only 'help' the insulin which is already there to work properly, or they encourage the pancreas to make more insulin.

With insulin-dependent diabetes, the pancreas has stopped producing insulin. This means that tablets would be of no use to a person with insulin-dependent diabetes.

9. Why can't insulin be taken as tablets?

Insulin is a protein and if eaten it would be digested in the stomach, just like meat, fish or other proteins, and it would be destroyed and not active anymore. Therefore insulin needs to be injected.

10. What causes insulin-dependent diabetes?

The answer to this is still not fully known, but whatever causes the onset of diabetes, you must already have particular factors on your

genes - which you inherit from both your parents. This makes you more likely to develop diabetes and therefore the likelihood of you developing diabetes is inherited or passed on in your family. However, the actual onset of diabetes is something different and is still uncertain.

It is thought that the cells in your pancreas which produce the insulin become damaged by a virus or your body's own defence system may start to damage these cells. The cells then produce less insulin until eventually they stop producing insulin.

11. Inheritance of Diabetes

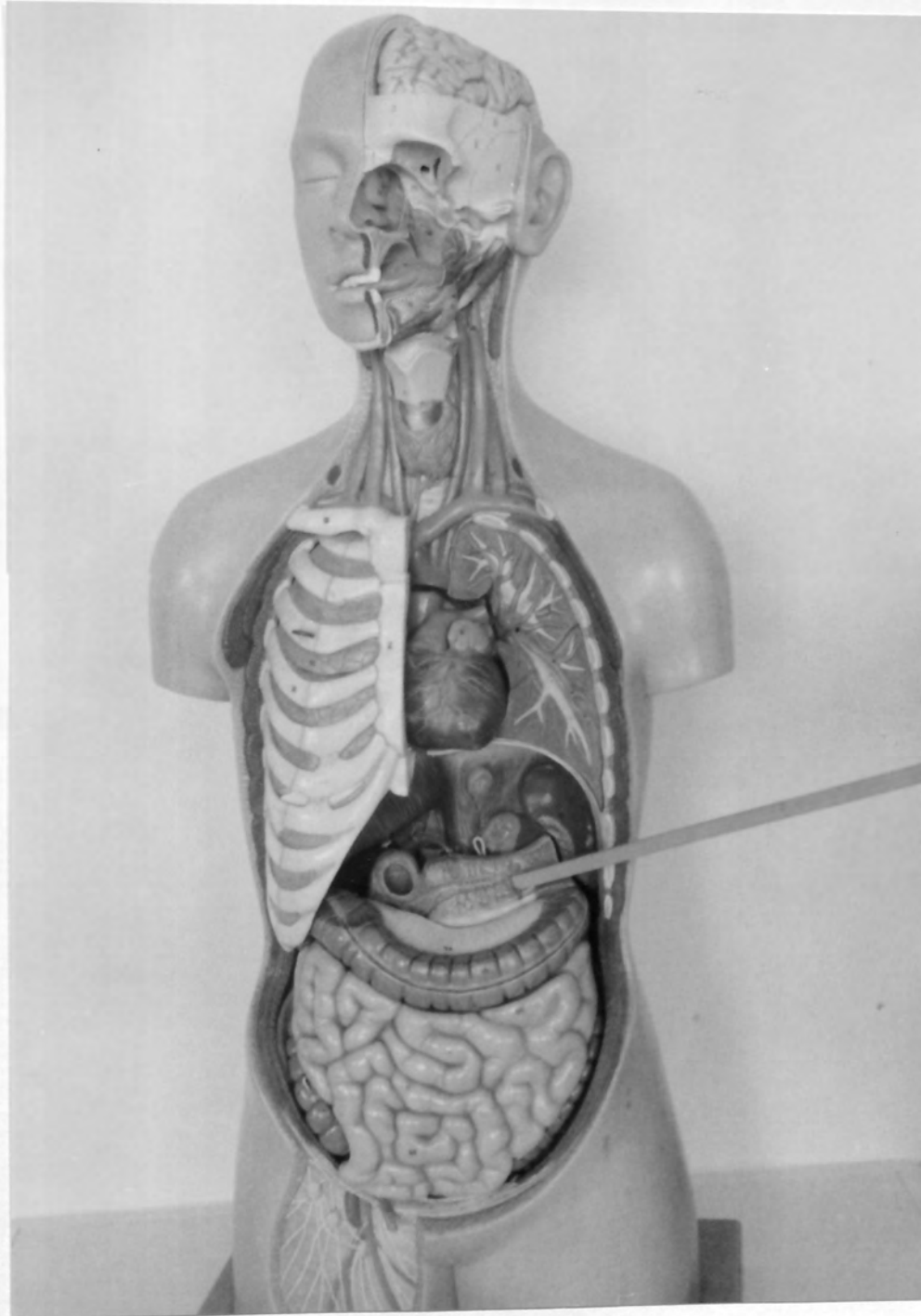
This is an important feature in diabetes, but is much stronger in the non-insulin-dependent diabetes. Insulin-dependent diabetes is not directly hereditary, like colour of hair or eyes. It is more complicated, and it is only the factors which make you susceptible or likely to develop diabetes which are passed on, therefore you don't inherit diabetes but you inherit the likelihood of developing it later.

Some of you may be the only person in your entire family who has diabetes, others may have brothers or sisters with diabetes - this shows us that in some families it is very weakly hereditary, yet in others it is more strong.

12. What are the chances of a diabetic woman's child developing diabetes?

In a normal situation, where a diabetic woman is married to a non-diabetic man, the chances of their children developing diabetes is only increased by about 1% more than another couple. But sometimes where the family history for diabetes is strong, this may increase.

Fig. S1 Anatomical model to illustrate the pancreas and digestive process





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SESSION NUMBER: 2

Topic: DIET AND DIABETES

Time: Approximately 1 hour

Format: Group - 3 to 7 patients

Resources: Food models from Dietetic Department
Slides - diet and diabetes
Learning questionnaire on diet (GMC)
Information sheet on diet (GMC)
Diet sheet for self-examination (GMC)
Anatomical model showing digestion

Aims:

To explain the reasons for maintaining a diet and to outline the recent recommendations concerning diet and diabetes.

Objectives:

That the patient will be able to:

1. Explain why consistency and regularity are important in the diet of an insulin-dependent diabetic.
2. Explain the effect of carbohydrate upon blood glucose concentrations.
3. Demonstrate a reasonable understanding of the 10 g carbohydrate exchange method of counting the dietary carbohydrates.
4. Correctly identify 10 g carbohydrate exchanges of the more commonly used foods.

5. Describe how different types of carbohydrate foods affect the blood glucose at varying time intervals and how this can be used in controlling the postprandial blood glucose concentrations.
6. Explain the benefits of a high fibre diet for a diabetic person and recognise foods which have a high fibre content.
7. Identify some of the 'high fat' foods and state why it is important to reduce the total dietary fat intake.
8. Describe ways of reducing dietary fat by using appropriate alternatives now available.
9. State the effect of alcohol on the blood glucose, the drinks which are acceptable for an insulin-dependent diabetic and what precaution to take before drinking alcohol.
10. Demonstrate acceptance of his/her own personal dietary recommendations.

STRUCTURE OF PRESENTATION

Transition:

To test 'recall' of information presented in session 1, several 'leading' questions were asked. Examples are shown below:

1. Which food do we need for energy?
2. Where does insulin come from?
3. What does insulin do to the blood glucose concentration?
4. Is insulin-dependent diabetes strongly hereditary?

Content:

The title of the session was introduced and patients were informed about the content of the session. All patients were asked to complete a personal diet plan (Fig. S4) for discussion in session 3, which was an individual format.

The importance of appropriate dietary recommendations in diabetes was explained with particular reference to the concept of achieving a balance between dietary carbohydrate and insulin dose.

The anatomical model (Fig. S1) was used to illustrate the fate of ingested food, and the effects of carbohydrate on the blood glucose was illustrated using slides (Figs. S8 and S9).

Food models (Fig. S5) were presented in order to distinguish between carbohydrate and non-carbohydrate food types, and to illustrate 10 g exchanges and various carbohydrate foods.

The absorption rates of various carbohydrate foods was considered and the subsequent effects on blood glucose control was demonstrated diagrammatically.

The benefits of high fibre foods was outlined and food models with a high fibre content were displayed.

Low dietary fat and salt intake was discussed, emphasising that such recommendations are also intended for non-diabetics, and that appropriate low fat/low salt alternatives are not specifically for diabetics.

Practical advice was given on ways to reduce dietary fat and salt.

Alcohol was considered by the group and general advice was given. Important features concerning alcohol and diabetes was emphasised, such as the blood glucose lowering effects, the carbohydrate content and strength of various alcoholic drinks.

All patients were provided with an information sheet (Fig. S6) to reinforce information presented, and were asked to complete a short questionnaire (Fig. S7) to be discussed in session 3.

Summary:

The information presented is summarised into six key facts. This served to enhance the 'recall' of the information later and provide an organised account of the information.

The key points were summarised in a series of statements listed below:

1. Carbohydrates are digested and changed to sugar which enters the blood.
2. The diabetic diet is a way of 'balancing' the amount of sugar with the insulin you have taken.
3. We count carbohydrates in 10 g carbohydrate exchanges or portions.
4. High fibre foods help to avoid high peaks of glucose in the blood after meals and do help to control the blood glucose.
5. Eating large amounts of fatty foods can increase the risks of heart disease.
6. Salt may help to increase your blood pressure.
7. Avoid sweeteners such as sorbitol or fructose.
8. Alcohol lowers the blood glucose and can cause a hypo.

Discussion:

The group was provided with several hypothetical practical situations in order to promote discussion and provided an opportunity to relate the dietary information to practical management.

1. If you wanted to go out for a meal in the evening, what would you do about your injection and evening meal?
2. If you were out socially and you required an exchange/portion but did not have carbohydrate such as biscuits, fruit, etc. with you, what could you have instead?
3. You have just woken up in the morning and your blood sugar is quite low immediately after you have given your insulin injection - what would you do?
4. Does a diabetic person's diet need to be very boring and restricted?

Motivational Aspects:

Patients were provided with personal diet plans, diet questionnaires and illustrative information sheets. These were used as a means of involving the patients in reviewing their dietary habits. Peer group discussion introduced elements of persuasion, encouraging other group members to adopt a favourable approach to diet, and accept the more recent dietary recommendations. Group discussions were important to provide the opportunity to communicate and relate to patients' problems concerning diet (Fig. S10).

Evaluation:

Generally, group participation was good and most patients related their feelings concerning dietary restrictions and how this affected their lifestyle. Many patients believed that they 'were' complying with dietary advice. However, it was apparent that some of these patients were not actually aware of many of the recent recommendations concerning diet, and that poor compliance was not intentional.

Poor dietary compliance was associated with lack of dietary knowledge. Patients with a larger duration of diabetes tended to know less about the current dietary recommendations including: low fat, high fibre and low salt.

Most patients understood the carbohydrate exchange counting system, but the importance of the actual carbohydrate source and subsequent effects on blood glucose levels was less well known. Alcohol and diabetes was completely misunderstood by many patients; most patients believed that alcohol raised the blood glucose and some patients thought that a diabetic person must never drink. A small proportion of patients continued to weigh carbohydrate foods but admitted that this was a matter of personal preference.

An important feature in this session was the support and encouragement provided by the more informed patients, and the elements of persuasion directed at other patients within the group. This was particularly important for patients who held old-fashioned ideas concerning diet. Peer group interaction was an essential component in order to enhance acceptance of dietary recommendations and encourage compliance.

DIET AND DIABETES: - Script

Note: Slides used in this session are illustrated in Figs. S8 and S9 following the script shown here.

1. Why is diet important for the insulin dependent diabetic person?

The diet is important for a person taking insulin because you are trying to 'balance' the amount of sugar you make from your food with the amount of insulin you are taking.

2. What happens to the carbohydrate foods you eat?

Carbohydrate foods such as potatoes, bread, apples, etc. are eaten and travel down the gut into your stomach and in the stomach they are digested. This means they are broken down and changed to sugar - we call this glucose, and some foods make more glucose than others. This glucose (sugar) then travels into the blood and out into the muscles or liver where it is used as energy or is stored for later.

3. How is the blood glucose controlled?

Normally, when a person eats carbohydrate foods, e.g. potatoes, the blood glucose will rise and this triggers the pancreas to produce insulin which helps remove the glucose from the blood - this means that the blood glucose is kept low. Unfortunately, as a diabetic you only have that supply of insulin which you injected in the morning or evening. This means that your body can only cope with a particular amount of carbohydrate. This particular amount of carbohydrate is the basis of your diabetic diet - so that you have a balance with your daily insulin dose, and that the timing of your meals also 'matches' the times at which your insulin is working best. Generally, we are trying to 'mimic' or 'copy' the non-diabetic person.

4. What is meant by 'diabetic diet'?

This is making sure the amount of carbohydrate you have at each meal is the same every day and that you count how much carbohydrate you eat because this is what will increase your blood glucose. The easiest way to do this is to count them as portions or exchanges - these are amounts of carbohydrate foods such as bread, potatoes, etc. that contain 10 g of carbohydrate (illustrate 10 g exchanges using plastic

food models) (Fig. S4). For example 1 small slice of bread = 10 g = 1 exchange. 1/3rd pint of milk = 10 g = 1 exchange (give other examples).

The dietitian will advise you on the amount of carbohydrate you need (or number of exchanges). This will depend on your age, weight, how active you are and the insulin you take.

Another factor which is important is when you take your carbohydrate exchanges. You want to try and spread the carbohydrate throughout the day so that you avoid high and low blood sugars as much as possible. Therefore it is better to have smaller but more frequent meals or snacks - again this does vary depending on the type and dose of insulin (illustrate various diabetic diets intended for insulin dependent patients).

7. Types of carbohydrate

There are three different types of carbohydrate - all of them will increase your blood glucose but some more quickly than others.

The first group are the simple carbohydrates - these are almost sugar already, therefore they take very little time to be digested and changed into glucose and enter the blood. The blood glucose will then rise quickly and gives you a peak and often it also falls quickly which may produce a hypo later on. Therefore, although a chocolate biscuit has two exchanges, it acts very differently than two apples, which is also two exchanges.

Group 2 are the starchy carbohydrates. These take longer to be broken down and changed to glucose and therefore do not increase the blood glucose as quickly as group 1 foods. Until recently, the diabetic diet consisted mainly of group 2 foods, which include white

bread, potatoes, plain biscuits, etc. However, in the last 10 years it was discovered that there are certain foods, called high fibre foods, which are digested more slowly and increase the blood glucose gradually and much less steeply. These foods can also slow down the speed at which other carbohydrates are digested. These high fibre foods or group 3 carbohydrates can make a great improvement in blood glucose levels, particularly after meals, and are of great benefit to a diabetic person. For example, if a fruit juice is taken with wholemeal bread the blood sugar doesn't rise as quickly as it would if the fruit juice was taken on its own.

8. Fats:

Fats do not increase your blood glucose and therefore you may think that it doesn't matter how much fat you eat. But there are certain problems with having large amounts of fat in your diet, because this then increases the fats in your blood - even if you are a thin person. If you have high amounts of fat in your blood, you are increasing the risk of heart disease and blood vessel diseases, and it is important to try and keep the fats in your diet as low as possible. This is particularly important for you because being diabetic you can have an increased risk of heart and blood vessel diseases later in life.

Most foods we eat contain some fat, yet we can't even see it. Particularly fatty foods include: red meats such as beef, pork, butter, cream, whole milk and cheese.

It is advisable to try and reduce the amount of these foods you eat.

9. Types of fat:

There are two types of fat: 1. Animal fats which are the common sources of fat and cholesterol in the blood. Another sort is 2. Vegetable fats - these are also called polyunsaturated fats - these are different from animal fats because they have less cholesterol and they are moved out of the blood more quickly.

Try and buy foods which contain pure vegetable fat rather than animal fats.

10. How to reduce your fats:

1. Use polyunsaturated margarines such as Flora, Vitalight, etc. or low fat spreads, e.g. Outline, Gold, instead of butter or other margarines.

2. Try skimmed milk or semi-skimmed milk. This is milk in which the fat has been removed - but it still contains the same amount of carbohydrate as ordinary milk.

3. Eat less meats - try chicken and fish, they have less fat. You shouldn't have more than 3 oz meat, 4 oz poultry or 5 oz of fish at each meal.

4. Grill foods - avoid frying.

11. Weight Watchers:

Fatty foods have lots of calories, therefore you can help yourself in two ways with lower fat foods:

(a) keep the blood vessels clear of fat

(b) help to keep your weight down.

12. Salt:

It is now recommended that everyone - not just diabetics - should cut down on the amount of salt they have. Salt contains a substance which can help to raise the blood pressure. If someone already has slightly high blood pressure, this is even more important. Most foods we buy already contain salt, e.g. bread, cereals, sauces, and tinned vegetables, so we would never run short of salt in our bodies.

Do try to reduce the salt you take by adding less to the cooking, tasting your food before adding salt or leave the salt pot off the table.

13. Sweeteners:

Try and manage without sweeteners, but if this is impossible, use sweeteners such as Hermaseta, Nutrasweet, Candarel. These tend to be low calorie sweeteners and therefore won't affect your weight. Some people find sweeteners bitter tasting and prefer to manage without. If you are using sweeteners such as these in cooking, it is best to wait until cooking is finished and then add the sweetener - this reduces the bitterness of the sweetener.

Sweetened foods or drinks which have saccharine or aspartamine in them are fine in moderation - these will be low calorie foods usually and again won't affect your weight. However, do avoid "foods for diabetics" which contain sorbitol or fructose - these are sweeteners which are quite fattening and are not particularly good for you.

14. Alcohol and Insulin-Dependent Diabetes:

Alcohol can lower the blood glucose level very quickly and it does this by affecting the liver. This means that when drinking alcohol you

are at risk of a hypo reaction, but this does not always happen straight away, your blood glucose may fall several hours later, which could be during the night. Another problem is recognising the 'hypo' signs when you have had several drinks. The signs for a hypo are very similar to the effects of alcohol.

CAUTION

Do be careful if drinking alcohol. You must consider your diabetes also. It is not a good idea to have an alcoholic drink if you know your blood glucose is quite low - eat something first. Make sure your blood glucose is not very low before you have an alcoholic drink. If you are due to have a meal or snack - don't miss it.

What can you drink?

There are various drinks which contain small amounts or no carbohydrates and therefore will not increase the blood glucose - these are acceptable but you must remember the warning above.

Avoid sweet drinks such as liquers, sweet wines or sherries, Guinness, etc.

Alcoholic drinks which are acceptable:

Ordinary beer } not diabetic beers, these are very high in alcohol
Ordinary lager } and calories, they are expensive and unnecessary

Dry wines

Dry sherries

Spirits - these do not contain any carbohydrates

Mixers - low calorie mixers don't contain sugar and are suitable to add to other drinks or on their own.

REMEMBER - Alcohol is very fattening.

How much can I drink?

If you only have an occasional drink then this is fine, but please remember the warnings about hypos.

If you drink regularly you should not have more than 2 pints or 4 shorts per day or at any one time, and better still, 1 pint or 2 shorts.

Fig. S4 Personal diet plans for use in individual discussion

YOUR DAILY CARBOHYDRATES

NAME

FILL IN THE FOLLOWING	NUMBER OF EXCHANGES
BREAKFAST _____	_____
MORNING SNACK _____	_____
LUNCH _____	_____
AFTERNOON SNACK _____	_____
EVENING MEAL _____	_____
BEFORE BED _____	_____
TOTAL NUMBER OF EXCHANGES	_____

Fig. S5 Food models used to consider dietary carbohydrates

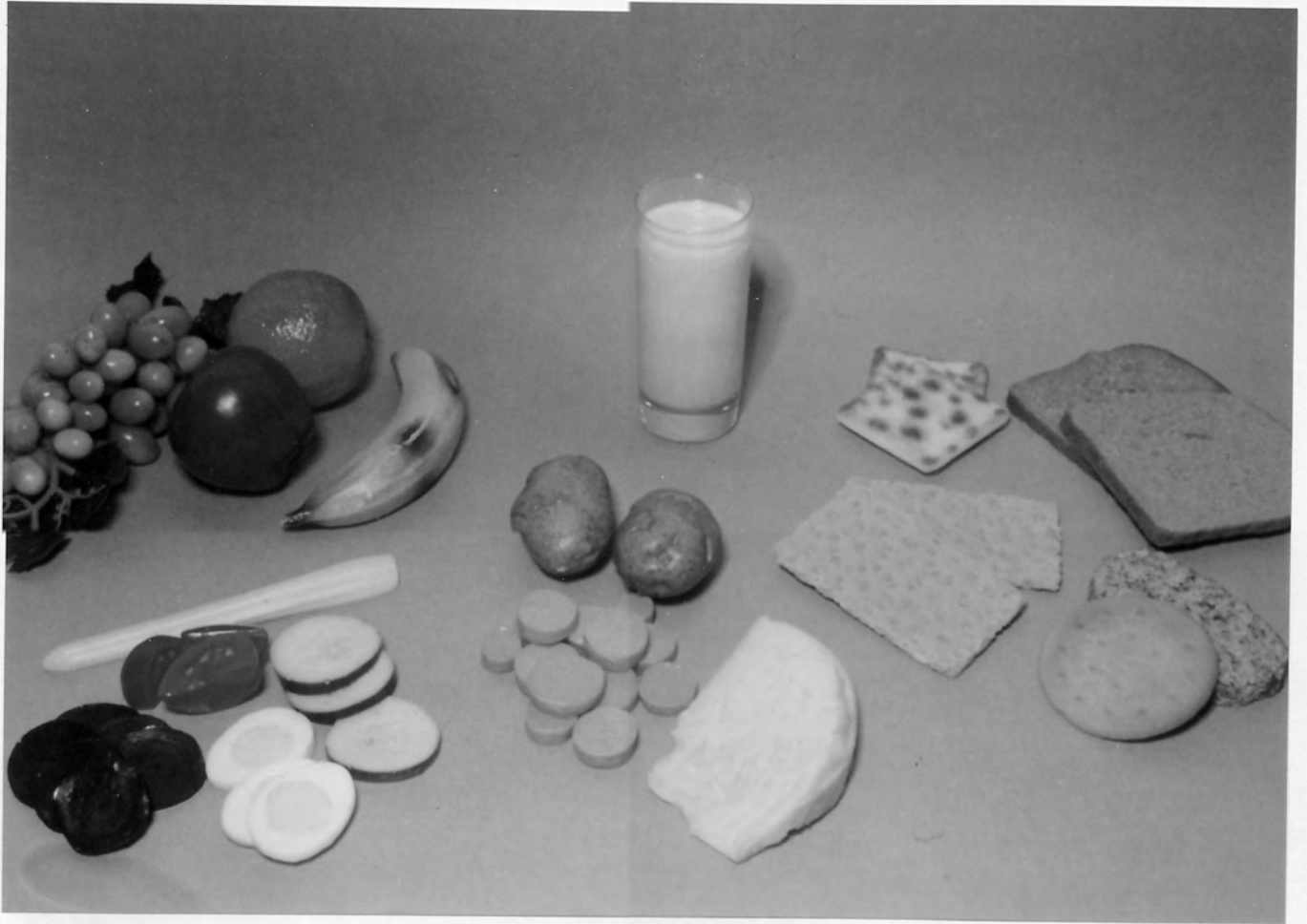


Fig. S6 Information Sheet concerning diet and insulin-dependent diabetes

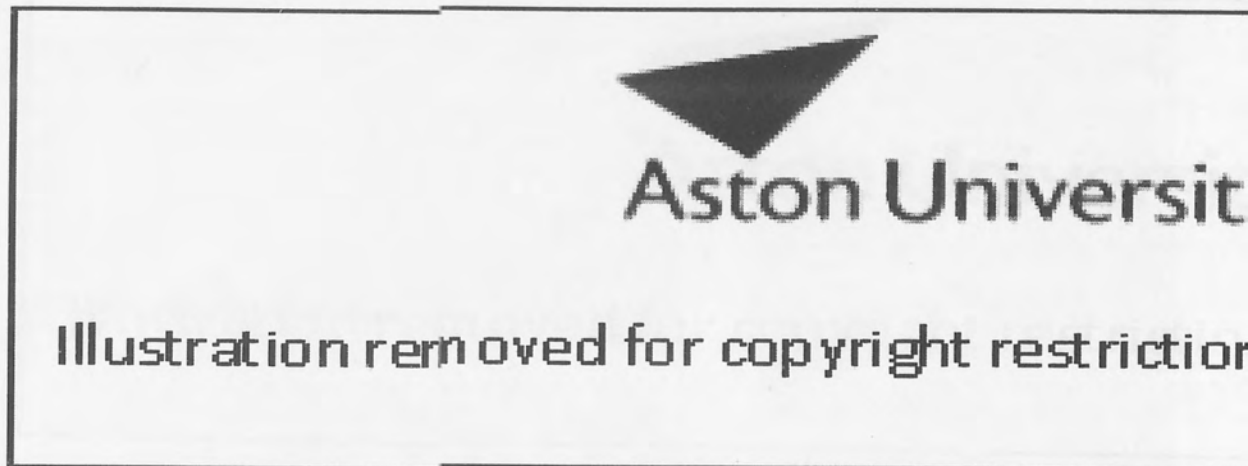


Fig. S7 Diet questionnaire to assess patient understanding

1.

YOU AND YOUR DIET

(1) Regular meals are important to you because:

(a) you are always hungry

(b) the insulin you have injected
is acting all the time

(c) I do not know

(2) 1 exchange or portion means it contains 10g carbohydrate:

(a) true

(b) false

(3) A diabetic person should eat lots of fat:

(a) true

(b) false

(4) Which of the following foods contain lots of fat?

(a) chips

(b) boiled potatoes

(c) 'fry ups'

(d) bread

(e) batters

(f) cabbage

(g) butter

(h) skimmed milk

2.

(5) Wholemeal bread is better for you than white bread:

- (a) true
- (b) false

(6) Why are high fibre foods good for 'you'?

- (a) they will raise your blood sugar very quickly
- (b) they help to keep the blood sugar lower after meals
- (c) they don't contain carbohydrates
- (d) I do not know

(7) Which of these foods contain fibre?

- (a) cornflakes
- (b) beans
- (c) crisps
- (d) jacket potatoes
- (e) wholemeal bread
- (f) fruit
- (g) vegetables
- (h) cereals

(8) Too much salt may help to :

- (a) increase your blood sugar
- (b) decrease your blood sugar
- (c) raise your blood pressure
- (d) I do not know

(9) Which of these foods have salt in them?

- (a) tinned vegetables
- (b) packet soups
- (c) red or brown sauce
- (d) crisps
- (e) 'ready to cook meals'

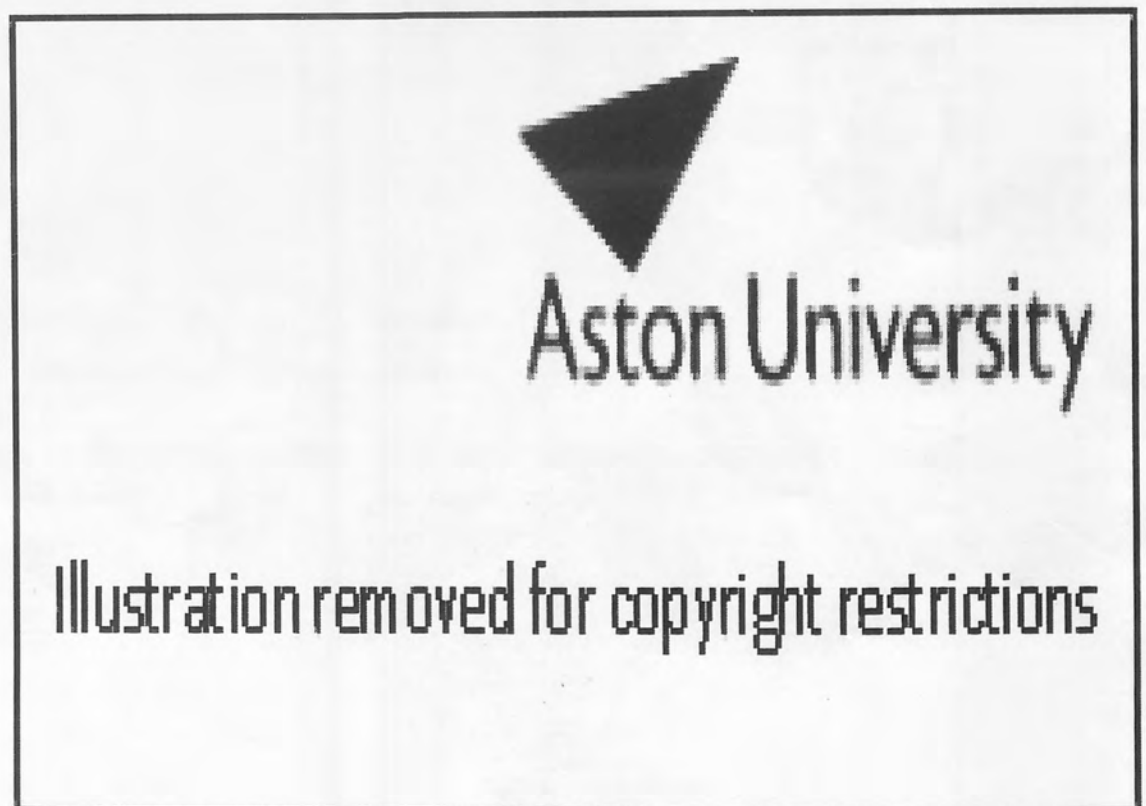
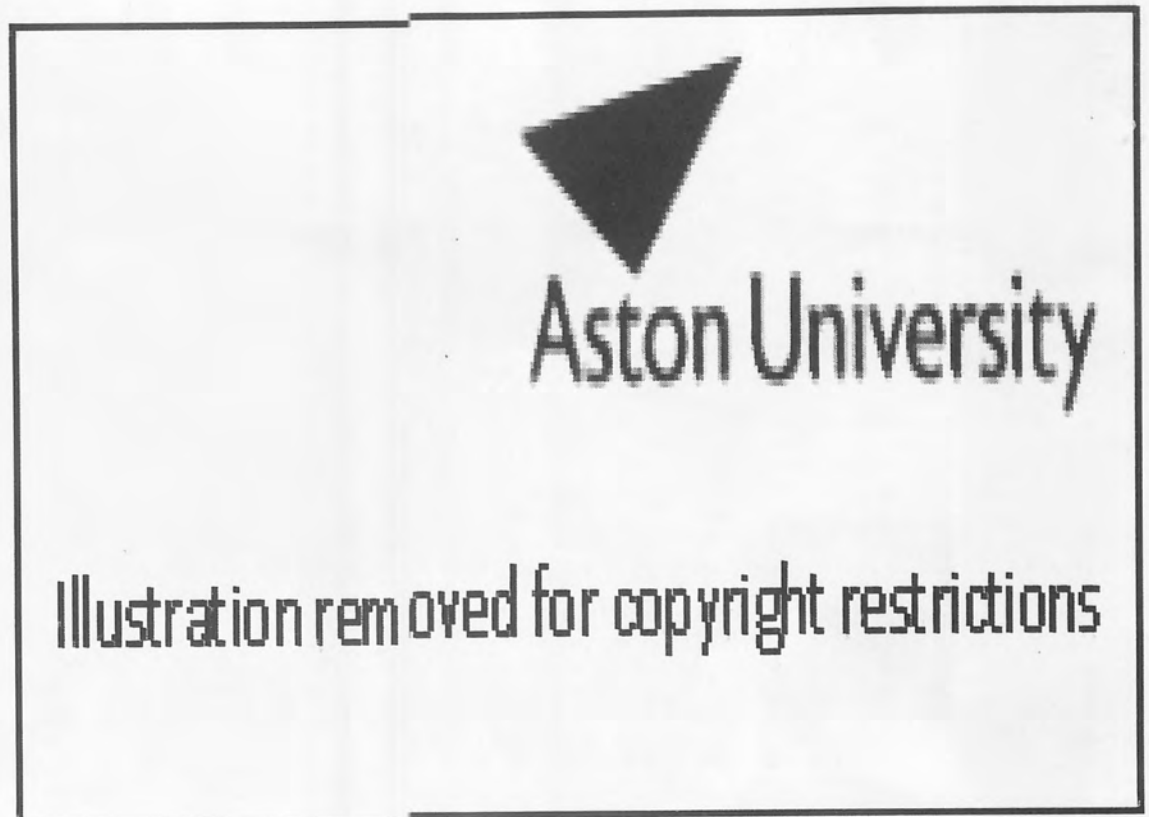
(10) Alcoholic drinks can lower your blood sugar

- (a) true
- (b) false

(11) Which of the following foods contain carbohydrate?

- (a) cabbage
- (b) bacon
- (c) fish
- (d) margarine
- (e) eggs
- (f) cheese
- (g) apples
- (h) milk

BY NOW YOU SHOULD BE AN EXPERT ON THE DIABETIC DIET !





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Fig. S10 Example of group teaching and discussion during the DE/MP



SESSION NUMBER: 3

Topic: INSULIN AND TREATMENT

Time: Approximately 3/4 - 1 hour

Format: Individual

Resources: Glass syringes; 1/2 ml and 1 ml

Disposable syringes - 1/2 ml and 1 ml

1/2 inch needle

'Practice' bottle of insulin

Slides

Information sheets (GMC)

Video: Insulin treatment

(produced at the Dudley Road Hospital, Birmingham)

Aims:

To assess the accuracy of drawing-up insulin and injection technique of the patient.

If necessary, demonstrate the correct procedures involved in insulin administration.

To provide additional information concerning insulin treatment which can facilitate improved glycaemic control.

Objectives:

That the patient will be able to:

1. Perform the correct procedure for drawing up and giving an insulin injection.
2. Describe the main injection sites and explain the rotation of injection sites.
3. State the most favourable angle at which one should inject and where insulin is injected, i.e. fat.
4. State the correct name(s) of the insulin he/she is taking.
5. State the dose of insulin he/she is currently taking.
6. Recognise the type of syringe he/she normally uses (1/2 or 1 ml).
7. Describe some factors which may affect the absorption of insulin.
8. State the duration of action of his/her insulin(s).
9. State the 'peak action' times of his/her insulin(s).
10. Demonstrate competence in altering insulin dose.
11. Describe how to maintain injection equipment.
12. State where insulin should be stored.
13. State the optimal time interval between injecting insulin and eating, and why this is important.
14. Demonstrate a less fearful attitude towards insulin and show confidence to practically apply the new information received.

STRUCTURE OF PRESENTATION

Transition:

The personal diet sheet and dietary knowledge questionnaire which the patient had completed were discussed, and feedback was provided by scores achieved on the diet questionnaire. Incorrect responses were considered and explained in more detail, ensuring adequate understanding.

The personal diet sheet (Fig. S4) which considers carbohydrate quantities only, was discussed and a further appointment with the dietitian was offered to the patient where necessary, and this was subsequently arranged.

Content:

The patients were informed of the topic to be discussed and the order in which the session would progress, therefore allowing the patient to perceive the organisation of the information to be presented.

A short video was presented prior to the session to introduce the subject and provide stimulus variation to the learning process (this can be obtained from the Diabetic Unit, Dudley Road Hospital, Birmingham).

Injection equipment, which included a variety of syringes, a hypoguard carrying case, industrial spirit, etc. were displayed. These were considered with respect to the advantages of glass or disposable syringes, maintenance of injection equipment and availability of these on the NHS.

Drawing-up insulin was discussed. The patient was asked to choose the type of syringe he/she was familiar with and to draw up his/her usual morning dose of insulin. This procedure was then repeated by the educator, emphasising the correct method where patients showed incompetence and explaining the reasons for such corrections. Where appropriate, the procedure for mixing two different types of insulins was demonstrated.

Injection sites were revised and patients were advised to use the thighs, buttocks and stomach. Reasons for rotating injection sites was outlined, and when possible the patient's injection sites were examined.

Injection technique was demonstrated by educator to ensure that the patient was familiar with the method observed, and if not, this was intended to promote questions and discussion.

Insulin absorption and various factors affecting the rate of insulin absorption were explained.

The three major types of insulins available; short, medium and long acting, were described and the usefulness of each of these explained. The patient's own insulin type(s) and regime were discussed with reference to peak action times, duration of action and type of insulin, e.g. pork, beef or human.

Patients were provided with information sheets illustrating the time action of their insulin(s) (Figs. S11 and S12).

The time interval between insulin injection and meal times was considered, and appropriate advice given depending on the patient's insulin regimen. The reasons for maintaining such a time interval was explained and the benefits to glycaemic control emphasised.

Patients were asked where they actually kept their insulin and, if necessary, they were advised to keep this in a cool place, e.g. fridge.

The aims of insulin therapy were outlined with particular emphasis on the importance of 'matching' insulin dose and diet and the way peak insulin actions should coincide with the times of carbohydrate intake.

Summary:

The information was summarised by bringing notice to the most relevant facts discussed in the session.

1. Markings on insulin syringes can go up to 100 or 50 units, and the insulin is measured in units only.
2. You want to remove air bubbles from the syringe to ensure that you have the correct amount of insulin in the syringe.
3. Exercise, heat, and smoking can affect the speed at which your insulin is absorbed into your blood.
4. Waiting half-an-hour between injecting and eating will give your insulin time to reach the blood and become active.
5. Insulin and diet are not separate treatments - you have to try and link them together.

Discussion:

Several probing questions were asked in order to encourage consideration of the information presented:

1. Do you still clean your skin before injecting?
2. What would you do if the needle became detached from the syringe whilst injecting insulin, and you were unsure of how much insulin you had injected?
3. What would you do if you found that you had no insulin left on a Sunday morning?

4. What would you think if you had a hypo at the same time everyday but you had eaten the right amount of carbohydrate?

Motivational Aspects:

Feedback and reinforcement were factors which resulted from discussion concerning the diet questionnaire. The individual sessions provided increased personal attention and the means for individual encouragement for each patient. Information sheets illustrating the patient's own insulin action times were provided and served as a reward and as a means of improving recall of the information presented.

Evaluation:

Most patients responded well to the individual session. However, some patients appeared to find the one-to-one situation uncomfortable or threatening.

Many patients showed a considerable lack of knowledge about the action times of the insulin(s) they were using and some patients could not state the name of their insulin(s). This session was very valuable in updating patients concerning injection technique, since some patients still thought it necessary to clean the injection site with industrial spirit, a number of patients still regularly boiled their insulin syringes and many patients had fears of injecting into veins and arteries and believed that this was the reason for removing air bubbles from the syringe.

Timing of insulin injection was very restricted for some patients. In one particular case the patient had her injection at 6.30 a.m. every

morning because this was the time of injection in hospital ten years ago. Patients with a longer duration of diabetes tended to impose more unnecessary restrictions on themselves compared to patients with a shorter duration of diabetes.

There was a high degree of patient involvement in this session, which appeared to enhance the interest by the patients.

A variety of resources were used; injection equipment, slides, information sheets, and video, and these allowed stimulus variation to be incorporated which helps to sustain the patient's attention and interest.

INSULIN TREATMENT: - Script

Note: Slides used in the session are illustrated in Figs. S13 and S14 following the script shown here.

Drawing-up insulin and the injection procedure are practical demonstrations and therefore will not be considered in script format. However, this script contains additional information which is intended to help patients understand the aims of insulin treatment and facilitate improved diabetic control.

1. Injection equipment: illustrate the various syringes and equipment
Glass syringes are available on the NHS and therefore they are free of charge. There are two types: a 1/2 ml one (illustrate) which holds up to 50 units and on these the markings increase in 1 unit steps. There is also a 1 ml type of syringe which can hold up to 100

units of insulin, the markings on this increase in 2 unit steps, e.g. 2, 4, 6, 8 - always check you have been given your type of syringe. Usually if you have smaller doses of insulin you will be provided with a 1/2 ml syringe.

Needles are also supplied on the NHS and again these are free of charge. They are usually 1/2 inch needles which are detachable. You should change the needle when it begins to feel blunt - there is no particular length of time you should use a needle for, this will really depend on the toughness of your own skin and personal preference. The syringe and attached needle should be kept in industrial spirit in a hypoguard carrying case. The spirit and case are provided by the NHS. The spirit should be flushed out of the syringe before each injection. It is not necessary to boil the syringe, but it can be taken apart and washed in soapy water and rinsed thoroughly about once a week.

Note: Several items have been mentioned which are available on the NHS free of charge. This is made possible because you are entitled to an 'exemption certificate'. This is a card which you apply for and allows you to obtain all prescriptions free of charge. You need to obtain a form from your own doctor to apply for one of these cards.

There are also disposable syringes available and these are syringes which usually have the needle fixed to the end of the syringe, although some may not. They are small and neat and the plunger has a rubber part on it which makes it fit better than that of the glass syringe (illustrate); these syringes do not need to be kept in industrial spirit. After using it the plunger should be pushed up and down to remove any insulin then the cap replaced over the needle and they can be kept in the fridge or any other clean place.

Some patients prefer them because they find them convenient, and can be sharper and less painful than the glass syringe. They do not need to be thrown away after use but can be used for as long as the needle remains sharp and the markings are clear - this usually depends on the person's skin and whether they inject once or twice daily.

Unfortunately, these syringes are not available on the NHS and therefore must be bought by the patient. Packs of 10 syringes cost approximately £1.30 and can be bought at the chemist or in the diabetic clinic.

2. Drawing-up insulin (demonstrate)

Take the syringe out of the case and flush out the spirit by pushing the plunger up and down several times. If you are using a plastic syringe this isn't necessary, just remove the protective cap from the needle. Drawing up insulin is the same whether you use a glass or plastic syringe.

First you need to inject air into the insulin bottle - this makes it much easier to draw up insulin from the sealed bottle. Pull the plunger down so that you have about the same amount of air as insulin you are about to draw up. Inject this air into the bottle. Now keep the needle in the bottle and turn this upside down so that the bottle rests on the neck of the syringe. Then draw up insulin, making sure the tip of the needle is below the level of insulin in the bottle. Draw up the exact amount of insulin; if you draw up extra then squirt back into the bottle.

If you find any air bubbles in the syringe then flick it gently and they should rise to the top of the syringe and you can push these back into the bottle. Sometimes you may have great difficulty removing

air bubbles, in which case you may need to push all the insulin back into the bottle and start again. Once you do have the correct dose of insulin, take the bottle off the needle and check.

If appropriate

If you are mixing two types of insulins, that is a clear and cloudy insulin, in the same syringe you must always draw up the clear insulin first. This means that you will have to inject air into the cloudy one first and leave this until you draw up the clear insulin. Draw up the clear insulin as explained above, then go back to the cloudy insulin and draw this up, remembering that air has already been injected.

3. Injection sites

The insulin should be injected into the fatty layer just under the skin and it is therefore important that the skin is pinched up to give a fold of that fat (illustrate). The skin is the thin layer on top of the fat and if you inject too shallow into the skin it will be painful. Also, below the fatty layer there is the muscle; you don't want it this deep into the muscle because it would be quite painful and the insulin will be absorbed far too quickly. However, you would probably need a long needle to reach the muscle.

Which area should you inject?

The best sites to use are the thighs, stomach and buttocks. Some people do inject the arms but it is quite easy to inject the muscle, particularly with a thin person, also it is more difficult to inject your own arm.

It is vital that the injection sites are rotated and that you do not use the same areas on these sites. This is important because the spot where you inject will become hard and lumpy and your insulin may not be absorbed properly.

Demonstrate the procedure for giving an insulin injection.

4. Absorbtion of insulin into the blood stream

The insulin you inject into the fat is absorbed into the blood vessels where it is carried to parts of the body where it can be active and work. Different types of insulins are absorbed more quickly or slowly than others, e.g. clear short acting insulin is absorbed into the blood more quickly than slow cloudy insulins. But other factors affect how quickly the insulin gets from the fatty layer into the blood stream. One factor is the place you inject into; insulin is absorbed more quickly if injected into the stomach, therefore it can affect the blood glucose more quickly than if you injected into the thighs or buttocks. These differences may not be even noticeable but they may make your blood glucose levels vary from day to day and it is therefore a good idea to have a regular (consistent) pattern of injection sites, e.g. inject the stomach in the mornings and the thighs/buttocks in the evenings. This might help to give you regular (consistent) patterns of blood glucoses every day.

Other factors which affect how quickly the insulin is absorbed includes smoking, exercise and hot baths.

Smoking: This can reduce the speed of absorbtion of insulin and therefore you might find that your blood glucose level is not as low as it could be. It is a good idea not to smoke for at least an hour after you have injected insulin.

Exercise: This increases the speed at which insulin is absorbed and you should be careful about timing of snacks or meals when exercising.

Hot baths: The heat causes the blood vessels to widen and improves the circulation to the surface of the skin, therefore the insulin which is in the blood can reach the tissues more quickly so that the insulin works more quickly. You also find that hot weather has this effect and that hypos may occur more in the summer.

5. Types of insulins

There are now many different types of insulins which start to act in the body at different times and which continue to work for various lengths of time. There are three main types: short, medium and long acting.

Short acting insulin: This starts to be active half an hour after it has been injected and lasts up to 5 or 6 hours. These insulins are always clear (illustrate).

Medium acting insulin: This only starts to work after 3 hours and continues to be active for up to 15 hours. These insulins are always cloudy or milky looking.

Long acting insulin: There are also long acting insulins which begin to work after three hours but can last up to 24 hours or more. These will also be milky or cloudy looking.

Discuss patient's types of insulin(s) with respect to the duration and peak action time using the appropriate slides and handouts.

The common insulins used at Dudley Road Hospital are:

<u>Name</u>	<u>Type</u>	<u>Duration of action</u>	<u>Peak action time</u>
Mixtard*	Pork	Medium acting upto 20 hours	4 - 6 hours after injection
Insulatard	Pork	Medium acting upto 20 hours	5 - 8 hours after injection
Actrapid	Pork	Fast acting upto 6 - 8 hours	3 - 4 hours after injection
Velosulin	Pork	Fast acting upto 6 - 8 hours	2 - 3 hours after injection
Monotard	Pork	Medium acting upto 24 hours	8 - 12 hours after injection
Neusulin	Beef	Short acting upto 9 hours	3 - 5 hours after injection
Neuphane	Beef	Medium acting upto 26 hours	7 - 8 hours after injection
Humulin S	Human (synthetic)	Short acting upto 10 hours	2 - 3 hours after injection
Humulin I	Human (synthetic)	Medium acting upto 24 hours	6 - 8 hours after injection

*Mixtard is classed as a medium acting insulin but it also contains short acting insulin: 30% short acting and 70% medium acting insulin

6. Time interval before eating

It is usual for people to have their injection before breakfast and before the evening meal, and this means that your body has insulin to cope with the extra starches or carbohydrates you will be eating. Remember that the shortest acting insulins are not absorbed into your blood immediately but that this takes about half-an-hour. Therefore, there is a delay between giving your injection and your insulin working. Therefore, it is also necessary to delay your eating time from when you injected insulin so that you match this pattern. It is

best to have your insulin approximately half-an-hour before you intend to eat. This prevents the blood glucose rising too much before the insulin is actually working and can help keep your blood glucose levels lower after meals.

You should try to establish a routine in the morning and evening so that you have your injection about the same time each day, and it is a useful way of always remembering your insulin injection. If you have to change the timing of your injection, you should always remember the peak action times and when you need to take meals or snacks.

7. Where to keep your insulin and why

Insulin can lose some of its activity and therefore does not function properly if it is kept in strong heat. This means that it must be kept in a cool place such as a fridge - but not in the freezer. For insulin you are using everyday then the fridge is not always convenient and you might want to keep it in the bedroom or bathroom. This is fine as long as they are in a cool place in the room and that it is not very hot.

8. Adjusting insulin - only if appropriate

It is very important to try and find out whether the insulin dose you take actually balances with your diet. The answer to this is: are your blood glucose levels satisfactory at various times of the day? You can find this out by testing your blood at different times of the day. If you find that there is a particular time of the day, e.g. mid-afternoon, when your blood glucose is consistently very low or very high, then you need to consider the insulin which is covering you at that part of the day and this may need increasing or decreasing so that

you avoid the high or low blood glucose. If you do alter your insulin dose, do so by 2-4 units only at each injection. Other occasions when you may need to adjust your insulin dose is when you are ill - often the blood glucose rises in illness, but you should not alter your dietary carbohydrate but increase your insulin if necessary. If you need advice at such a time you should 'phone D7B - the Diabetic Unit.

Various hypothetical cases of high or low blood glucoses at different times of the day/night should be considered and the response discussed in relation to the patient's insulin regimen.



Fig. S11 Example of Insulin Information Sheet used in Session 3

VELOSULIN INSULIN

1. Pork insulin
2. Short acting

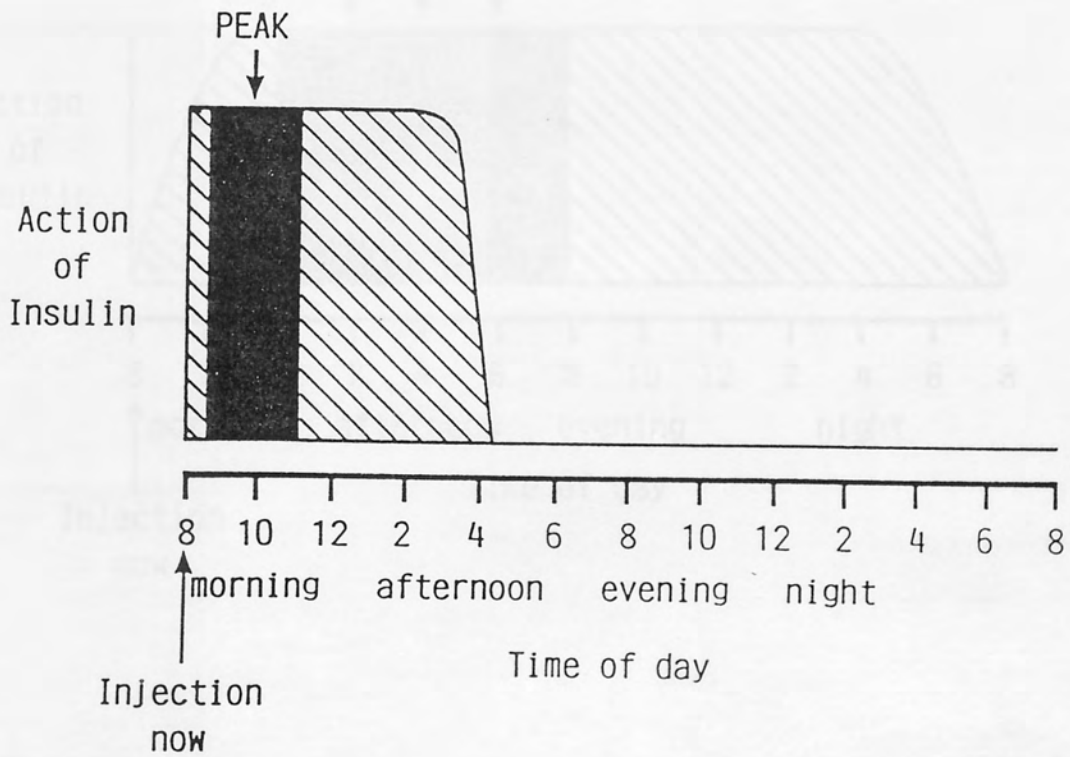
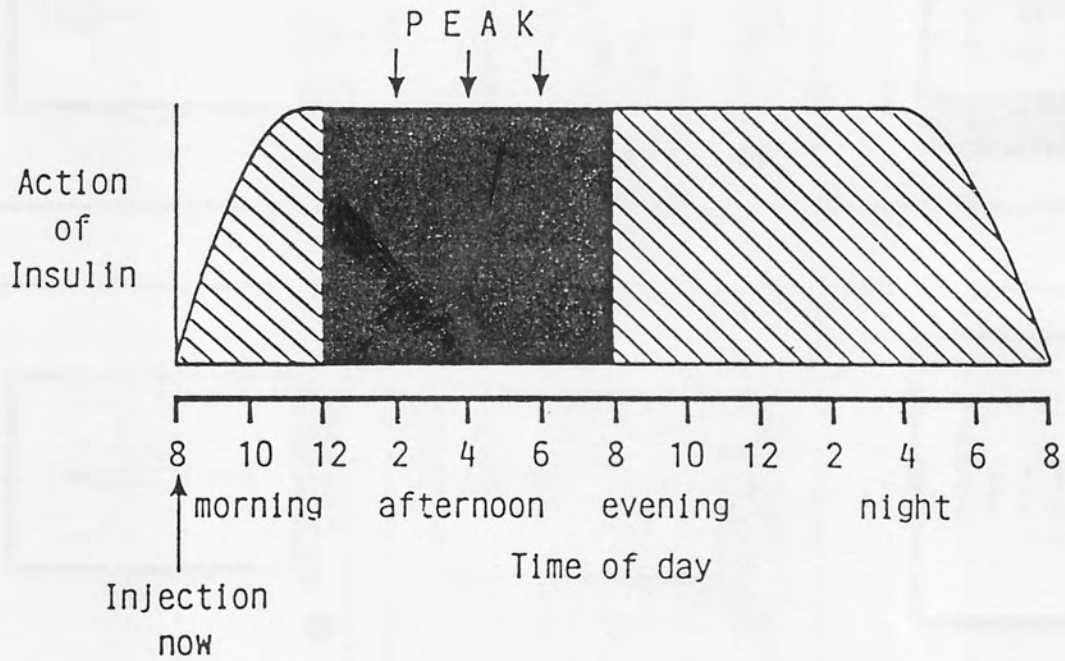


Fig. S12 Example of Insulin Information Sheet used in Session 3

INSULATARD INSULIN

1. Pork insulin
2. Medium acting





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Fig. S14 Slides used in session 3 - 'Insulin and Diabetes' (cont'd)



SESSION NUMBER: 4

Topic: HYPOGLYCAEMIA

Time: Approximately 1 hour

Format: Group session - 3 to 7 patients

Resources: Slides on hypoglycaemia - Dudley Road Hospital
Video - a British Diabetic Association production
Illustrative information sheets (GMC)
Glucagon kit

Aims:

To describe the causes, symptoms and effective treatment of hypoglycaemia and to discuss the problems and anxieties associated with hypoglycaemia.

Objectives:

That the patient will be able to:

1. Distinguish between hypoglycaemia and hyperglycaemia.
2. State the blood glucose range at which hypoglycaemia may occur.
3. Appreciate the importance of regular snacks and meals to avoid hypoglycaemia.
4. Describe the common symptoms of hypoglycaemic reactions.
5. State common causes of hypoglycaemia.
6. Describe the appropriate responses when dealing with hypoglycaemia
7. Explain why large amounts of carbohydrate are not usually required for a hypoglycaemic reaction.

8. Describe the purpose of a glucagon kit and how this works in the body.
9. Appreciate that hypoglycaemia does not result in permanent damage to the body.
10. Demonstrate a confident and reassured attitude towards hypoglycaemia.
11. Communicate their feelings and experiences regarding hypoglycaemia

STRUCTURE OF PRESENTATION

Transition:

To enhance the recall of information presented in the previous session, several leading questions were asked, e.g.

1. What is the aim of insulin treatment in relation to our diet?
2. Why are you asked to wait half-an-hour after your injection and before eating?
3. What part of the body do we inject insulin into?
4. Is insulin working all through the night or is it only working during the day?

Content:

The topic was introduced by illustrating a BDA video concerning hypoglycaemia (obtained from the British Diabetic Association, 10 Queen Anne Street, London W1M 0BM). The content of the session was outlined; each patient was provided with an illustrative information sheet (Fig. S15) showing the features to be discussed and the order in which they will appear.

Hypoglycaemia was distinguished from hyperglycaemia and other terms for hypoglycaemia were described, e.g. 'hypo', 'reaction', 'turn'.

The concept of hypoglycaemia as a lowering of the blood glucose was described and illustrated graphically.

Patients were asked to describe the symptoms of hypoglycaemia they had experienced. These were subsequently discussed and illustrated diagrammatically.

Patients were asked to state some of the possible causes for hypoglycaemia and to discuss ways in which it may be prevented.

Appropriate treatment of mild or severe hypoglycaemia was described. Patients were asked to describe the procedure they would usually adopt. Suitable foods/drinks to take for hypo reactions were illustrated.

The use of glucagon tests were introduced by considering the case of the diabetic person who does not receive sufficient warning signs for hypoglycaemia. The way in which glucagon is prepared was demonstrated and its function in the body explained briefly.

The body's glucogenetic response to hypoglycaemia was discussed briefly, and reassurance given concerning nocturnal hypoglycaemia and the risks of coma.

Patients were asked to relate their experiences and feelings concerning hypoglycaemic reactions, particularly in everyday situations such as work, leisure, etc. and to discuss any problems which had arisen due to

hypoglycaemia. All patients were provided with an information sheet (Fig. S15) to reinforce information presented.

Summary:

The information was summarised by a list of key facts presented in the information.

1. Hypoglycaemia is when your blood glucose falls too low - this is usually about 3.5 mmol/l and less.
2. Your brain needs glucose; when the glucose is too low the brain sends messages to different parts of the body to let you know - these are the warning signs, e.g. shaking, sweating, etc.
3. When you have a hypo reaction eat something sweet or refined, this will raise your blood glucose quickly.
4. If you have a hypo, don't get upset and angry, try and work out the reason your blood glucose was low then you may be able to prevent it next time.
5. Alcohol can lower your blood glucose and cause hypoglycaemia - always be careful when drinking alcohol.
6. Carry something sweet with you all the time, e.g. dextrose, sugar, sweets, etc.

Discussion:

Several probing questions were asked to encourage patients to relate personal experiences involving hypoglycaemia, to promote a less fearful attitude towards hypoglycaemia and to provide support and reassurance.

1. Have you every done anything silly when you have been hypo?

2. Do you think you sometimes purposely keep your blood glucose higher than normal to avoid hypoglycaemia?
3. Do you get upset and angry after a hypo or can you pass it off easily?
4. Would you warn your close friends and work mates about hypoglycaemia?

Motivational Aspects:

Peer group discussion enabled patients to express their fears and frustrations concerning hypoglycaemia and to relate their personal experiences. Information presented was intended to enhance a confident and reassured attitude.

Simple fact sheets were provided to promote reinforcement and recall of knowledge learnt (Fig. S15).

Evaluation:

Peer group discussion was usually very successful and patients were keen to express their own thoughts on hypoglycaemia.

All patients were aware of and could suggest several causes of hypoglycaemia.

Most patients were unaware of: alcohol increasing the risk of hypoglycaemia, the body's glucogenetic response, the use of glucagon kits, or the significance of slight ketonuria.

The information presented in the video appeared to be inadequate and over-simplified for these patient groups. Group discussion was a valuable means of facilitating the learning/teaching process in this session.

Supplementary information sheets provided organisation in the structure of the session, ensuring that all the key facts were included in the discussion.

HYPOGLYCAEMIA:- Script

Note: Slides used in the session are illustrated in Figs S16 and S17 following the script shown here.

Show the BDA video if possible, and consider the following statements and questions:

1. What is 'hypoglycaemia'?

Hypoglycaemia or a 'hypo' is when the blood glucose falls too low. You may start to feel hypo when your blood glucose falls below 3.5 mmol/l.

2. Why do diabetics have hypos?

You inject a certain amount or dose of insulin into your body and this is balanced by a particular amount of carbohydrate or exchanges in your diet. Sometimes this carbohydrate may be used up too quickly or is not enough and there is more insulin than is needed which means the blood glucose falls. Remember, once you have injected insulin into your body you cannot 'switch it off', but you have to balance it with your diet.

3. What happens in the non-diabetic?

As the blood glucose falls the body can detect this and passes a message to the pancreas to 'switch off' insulin production. This stops hypoglycaemia from occurring.

4. 'Hypo' - what happens in your body?

Your brain needs glucose in order to work properly and allow you to think straight and act normal. When the blood glucose starts to fall below 3.5 mmol/l the brain detects this quickly and sends messages to other parts of the body so that 'warning signs' are given. These are signs to let you know you have a low blood glucose and that you need to eat something that will raise your blood glucose quickly.

5. What are the signs of a hypo?

The signs which often appear include:

Shaking

Sweating

Tingling of the lips and mouth

Hunger

Confusion

Awkwardness

You may get one or more of these and they vary from person to person.

6. Reasons for hypoglycaemia.

(a) Making a mistake in your insulin dose - if you injected too much insulin you would not balance this with the normal carbohydrate amount in your diet and the blood glucose would be low.

(b) Taking more exercise than usual - so you would use up the glucose in your blood more quickly than normal - causing the blood glucose to fall.

(c) Being late for a meal - your meal times should coincide with peak action times of your insulin, i.e. when it is working best. This means if you are late for a meal your insulin is working well, causing the blood glucose to fall.

(d) Missing a meal or snack - a major reason for having regular meals and snacks is to avoid hypos - if you miss these you will not be balancing the carbohydrate with your insulin dose.

(e) Drinking alcohol - this does lower the blood glucose by the way it affects your liver. Check you are not too low, particularly before going to bed.

7. What to do when you are hypo?

When you are hypo you do need to eat something which will raise your blood glucose quickly, e.g. dextrose sweets, biscuits, chocolate, orange squash, milk or sugar in water.

These are all absorbed into the blood straight away and bring your blood sugar back to normal fairly quickly.

ALWAYS CARRY SOMETHING SWEET WITH YOU - PARTICULARLY IN A CAR IF YOU DRIVE.

8. How much do you need to eat?

There is very little difference between a normal blood glucose and a hypo, and you do not need much carbohydrate to raise your blood glucose back to normal. Try taking 10 g or 20 g (1 or 2 exchanges) in the form of sugar or other sweet carbohydrate. Allow 5-10 minutes for



this to reach the blood stream and increase the blood glucose level. You may find you still feel hypo and need a further exchange.

The exchange value (carbohydrate value) of some sweet 'hypo' foods/drinks are shown below:

	Quantity	=	1 exchange or 10 g
Dextrose sweets	3 sweets		1 exchange
Sugar	1 teaspn		1 exchange
Orange squash	2 tablespn		1 exchange
Chocolate	2 squares		1 exchange

There is no need to eat enormous amounts of carbohydrate or sugar when you are hypo otherwise your blood glucose will swing the other way to give you a high blood glucose level. Also your own body does produce some sugar for you, but this happens slowly and you do need to eat something before this occurs.

9. Hypos during the night

Hypos can also occur during the night as well as in the daytime - remember your insulin is working 24 hours a day. The warning signs for a hypo are usually strong enough to wake you in the night; you will feel sweaty and shaky. Eat something which increases your blood glucose level quickly.

Sometimes the warning signs may not be strong enough to wake you when you are hypo. In this case the body will make some glucose itself in order to increase the blood glucose level.

The body makes this extra glucose by breaking down fat in the body - but this produces some ketones and is not good for diabetic control. If this does ever happen you will probably wake up feeling unwell, with a headache and show a trace of ketones in your urine.

10. Hypos without warning signs

Some people get very little or no warning signs that they are hypo and the blood sugar falls too low and they may become unconscious before they have had a chance to eat or drink something sweet. This means the person must be treated in hospital by injecting glucose into the blood. If this happens the person would be given a 'glucagon kit' for the future. This is a kit which contains a substance which has the opposite effect to insulin - that means it makes sugar in your body. When this is injected into the muscle it raises the blood glucose very, very quickly so that the person becomes conscious again within minutes and need not be taken to casualty. Relatives or close friends of the person are taught how to draw-up and inject glucagon.

Hints on Hypos

1. If hypos occur regularly and at a particular time of the day you may need to make changes in your insulin or diet. You can 'phone the Diabetic Unit for advice.
2. When you have a hypo don't get upset and angry about diabetes - try and think of the reason why you were hypos. It may be increased activity, missed snack, etc. - at least you know for the next time.
3. Hypoglycaemia is not dangerous in itself but you are not in full control of your body when you are hypo and should be careful about falling or hitting something. This is why it is important to act quickly.
4. There is very little difference between a normal blood glucose and the hypo level - it is important then not to be afraid of hypos if you are trying to get good diabetic control.

5. Do explain about hypos to the people you are close to at work or at home - and make sure they know what to do if you become awkward.

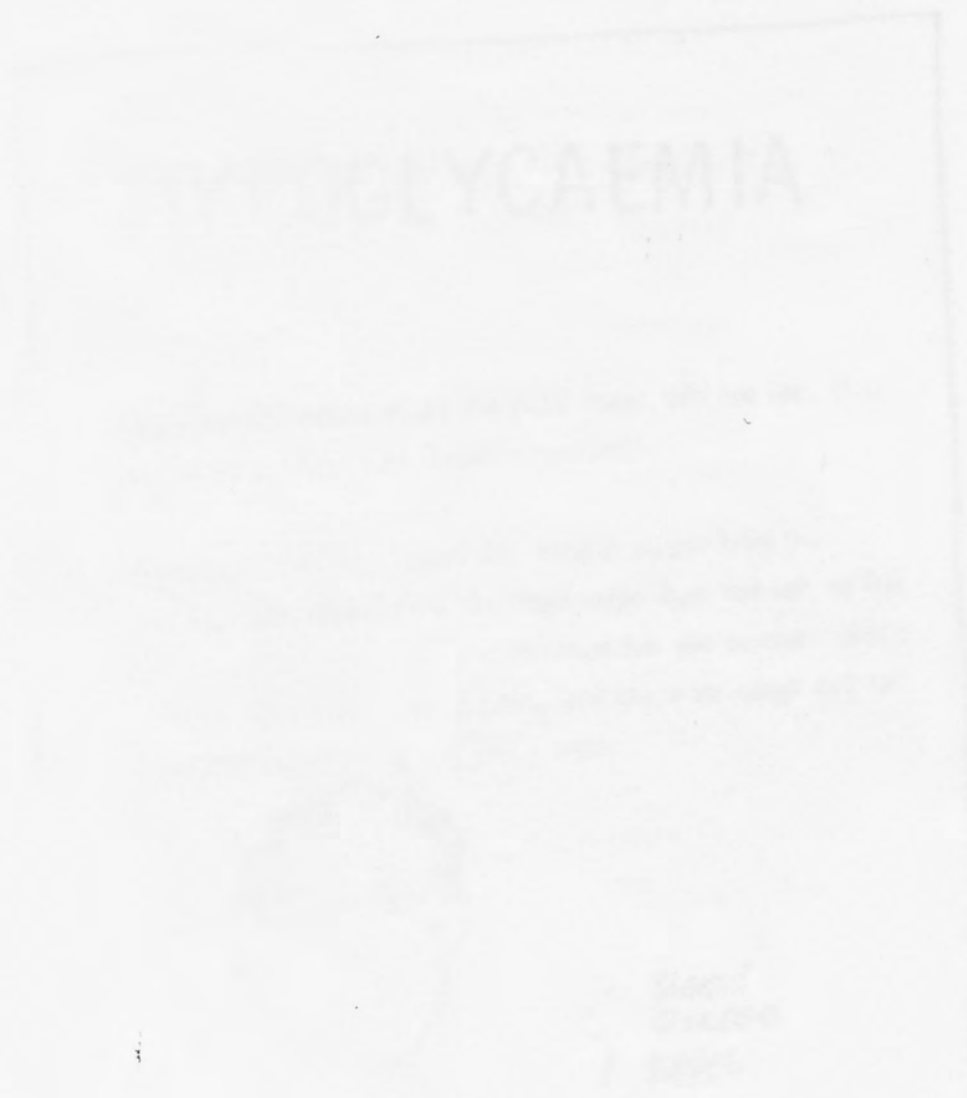
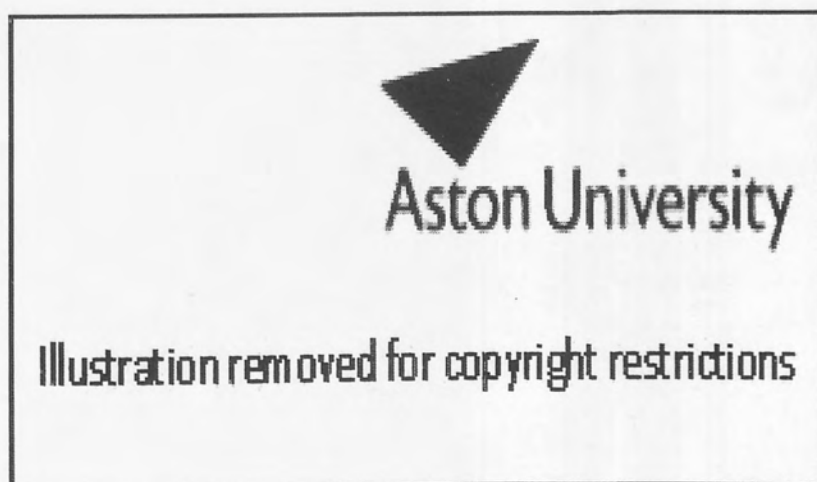
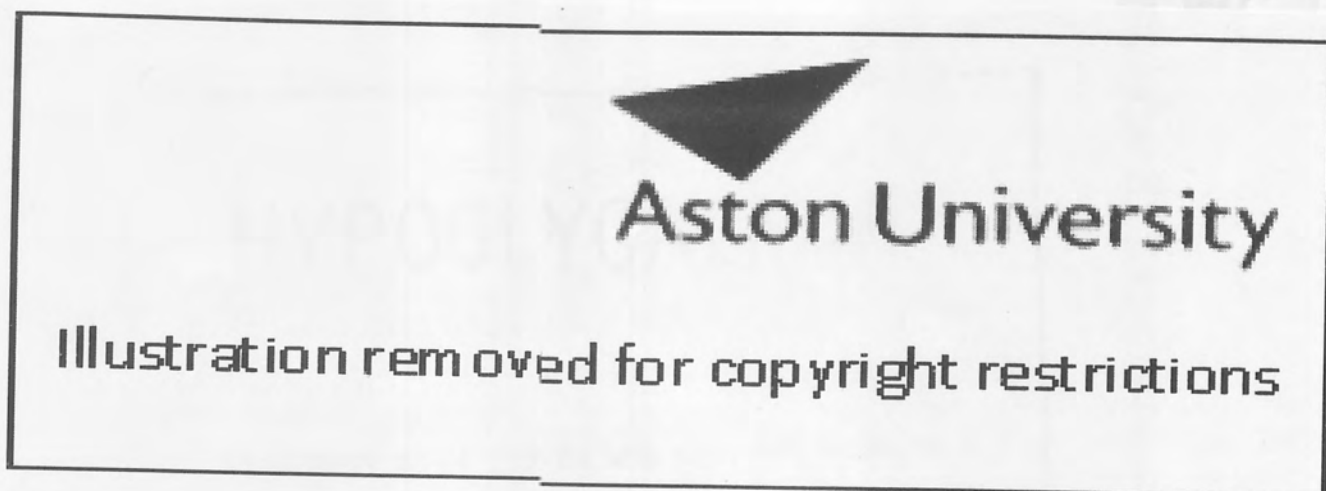


Fig. S15 Information Sheet concerning hypoglycaemia in insulin-dependent diabetes





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SESSION NUMBER: 5

Topic: DIABETIC CONTROL

Time: 3/4 hour

Format: Individual

Resources:

Information sheet for home blood glucose testing (GMC)

Blood glucose testing equipment - B.M. sticks

lancet

cotton wool

watch/timer

recording diary

Glycosylated haemoglobin (HbA₁) results - illustrated graphically.

Aims:

To clarify the meaning of "diabetic control" in terms of blood and urine glucose concentrations and HbA₁ levels. Also to consider the individual's aims for glycaemic control and encourage achievement of these goals.

Objectives:

That the patient will be able to:

1. Demonstrate the correct procedure for blood glucose testing using B.M. 20-800 test strips.
2. Describe the correct procedure for urine glucose testing using Ames 'Diastix' test strips.

3. State the optimum blood glucose range (mmol/l) and urine glucose level (%).
4. Explain some of the differences between blood and urine glucose tests regarding their accuracy.
5. State the appropriate times for blood testing.
6. Demonstrate a willingness to test blood 1-2 days per week at the recommended times.
7. Recognise the necessity for adjustments in insulin dose or diet on interpretation of results.
8. Demonstrate an understanding of the glycosylated haemoglobin test (HbA_{1c}) and its usefulness.
9. Show enthusiasm and keenness to improve HbA_{1c} levels.
10. Perceive diabetic control in terms of achievement and relate this to personal goals or aims.

STRUCTURE OF PRESENTATION

Transition:

The patient's understanding of the information presented in previous sessions was examined by considering a number of hypothetical situations. Example 1. If you found your blood glucose level usually rose above 13 mmol/l at about 4 p.m., what could you do?

Example 2. If you were hypo before your morning insulin, what would you do? Further explanation was given when necessary.

Content:

Patients were informed of the content and structure of the session and how they would be involved.

Urinary glucose testing was discussed with particular emphasis on the interpretation of the results. Patients were advised to aim for negative concentrations rather than a trace or more. The significance of this, with reference to normal blood glucose concentrations, was explained.

Blood glucose testing was discussed emphasising the reasons for testing, the normal blood glucose range, the desired blood glucose range, interpreting results, responding to test results and advantages compared to urine testing.

The correct procedure for blood glucose testing was demonstrated using B.M. test strips in conjunction with simple written instructions which were transposed from the original instructions (Fig. S18). Patients were also asked to demonstrate the correct procedure, to ensure adequate understanding and accuracy.

The desired blood glucose concentrations and the most appropriate times to test were recorded on the written instruction sheet - therefore providing a source of reference at home.

Several hypothetical situations concerning high or low blood glucose concentrations were described and patients were asked to comment on how they would respond. This considered the interpretation of test results and related insulin diet and exercise to the blood glucose.

The glycosylated haemoglobin test was described in simple terms - as "sugar coated particles in the blood". The results of previous HbA₁ tests were shown to the patient - these were illustrated graphically

on a personalised sheet for each patient as shown in Fig. S19. The results were explained and discussed. Patients were asked to choose a HbA₁ level or range they thought they could achieve in the following 1-2 months, and a type of 'verbal contract' was made. The goal of achievement was set by the patients themselves but was also realistic. This increased the incentives to attain this goal.

Patients were asked to record their blood test results in a diary provided and to retain the corresponding test strips and to bring these with them on subsequent visits so that results could be discussed.

Summary:

The information considered in the session was summarised by condensing the main points into a number of sentences.

1. It is not normal to show glucose in the urine - this should be negative.
2. The normal blood glucose range is between 3.5 and 8.0 mmol/l.
3. The aims of diabetic control are to copy or mimic the non-diabetic as much as possible - trying to keep the blood glucose in this kind of range, or between 4-10 mmol/l, is more realistic.
4. Remember to interpret your results - particularly if they are high or low at a particular time of the day. Think of what you could do.
5. The higher your blood glucose the more sugar coated protein will form - this indicates poorer control - try to lower the HbA₁ level.

6. No one can help your diabetic control until you first of all help yourself - know what your levels are.

Discussion:

Several probing questions were asked to investigate whether the information was understood and to discuss and revise the concept of "diabetic control".

1. Should there be any glucose in the urine?
2. What are we doing in trying to achieve diabetic control?
3. Why do we want to have good diabetic control?
4. Do you feel your diabetes could be better controlled?

Motivational Aspects:

A most prominent source of motivation was the opportunity for achievement - a known motivator of behaviour. Contracting enhanced this commitment and therefore motivation to achieve the set goals in terms of glycaemic control. The individual session allowed for 'tailoring' of the advice and aims to suit different patients whose capabilities varied considerably. This personalised approach provided increased attention and encouragement to improve diabetic control.

Patients were provided with a blood testing kit, recording diary and instruction sheet; these served as the enabling factors therefore enhancing home blood glucose monitoring, recording and evaluating diabetic control.

Evaluation:

Many patients did not appear at ease initially when they were informed that 'their' diabetic control would be under discussion. Most people were very embarrassed if their blood glucose concentration was high and often tried to offer an explanation to account for this.

Many patients were under the impression that it was better to have a trace of glucose in the urine rather than being negative, and that they 'felt safer' if this was the case.

Approximately 80% (28) of patients carried out home blood glucose monitoring prior to this session. However, of these patients many were doubtful about their interpretation of test results and some could not state the normal blood glucose range as shown on the side of the test strip containers, even though they carried out blood glucose tests. All patients were unaware of the HbA_{1c} test but were very interested and eager to know their own result and how this reflected their diabetic control.

The session usually ended in discussion concerning diabetes in general, and patient participation was very good. Honesty was a prominent feature in this session, patients expressed their feelings readily and were truthful about the amount of effort they directed to achieving better control - even when this was very little.

The gradual improvement in rapport and communication was sensed throughout the session.

BLOOD GLUCOSE CONTROL: - Script

1. What does 'diabetic control' mean?

This means keeping the amount of sugar or glucose in your blood at levels which are close to the normal range found in a non-diabetic person. This range is between 3.5-8, and this is measured in units called mmol/l.

2. How do you know how much glucose there is in the blood?

There are two ways to find this out:

(a) By testing your blood using B.M. sticks - demonstrate. The normal glucose concentration is 3.5-8 mmol/l. On the B.M. sticks you should try and aim to keep the glucose level between 4.4-10 mmol/l - as shown on the container. It should be nearer to 4.4 mmol/l at meal times since you will be eating carbohydrate which increases the glucose level.

Do cut the sticks in half lengthways. These are very expensive and also you will only need a small drop of blood with a pad half the size.

(b) By testing your urine using Diastix - demonstrate. The urine should not contain any glucose because if glucose does appear in the urine it indicates that there was too much in the blood and that the body is trying to get rid of the extra by filtering it out through the kidneys. Glucose usually starts to show in the urine if the blood glucose level increases to above 10 mmol/l.

Urine testing is a good guide to indicate whether your blood glucose is high, but does not show you how low the glucose is.

Also, you must be careful about the time you test your urine - if this is the first urine sample passed in several hours or since the night before, then this will have been stored in the bladder for a while. This urine then will show the amount of sugar which was in your blood at the time the urine was formed and it doesn't tell you about your blood glucose level when you are doing the test. To avoid this, it is best to go to the toilet and empty your bladder first and then as soon as possible afterwards pass another urine sample which is your sample which you will test.

3. How often should you test your blood/urine glucose?

This will depend on your daily routine and how convenient it is for you to test.

If you test your urine only then you should test at least twice a day to make sure your urine does not have any glucose present.

Times to test are:

Before breakfast (must be the second urine sample passed)

Before lunch

Before evening meal

Bedtime

If you are working or very busy during the day, do as many of these as possible or take 3 or 4 days a week on which to do all the tests.

There are times when it is particularly important to test more often, e.g. when you are ill your blood glucose may increase; you should therefore test more regularly to check this.

If you are testing your blood glucose levels also, you should try and take 1 or 2 days a week on which you do several tests to find

out what your glucose levels are like throughout the day. These times to test are:

- Before breakfast
- 2 hours after breakfast
- Before lunch
- 2 hours after lunch
- Before evening meal
- Before bed

There are other times when it is important and useful to test your blood, such as illness, after exercise, weekends when routine is often broken, holidays and other times when eating and activities might be altered.

Even if you test your blood regularly (i.e. 2 days/week), you should make use of urine testing to check your glucose levels on other days. You may just want to do the test once a day - making sure that there is no glucose present.

4. Interpretation of test results

Once you have tested your urine or blood glucose you need to decide whether it is satisfactory or not. If the test shows that your control is not really good enough you should try and think why this is so. It might be because you have eaten too much that day, or that the carbohydrate allowance in your diet does not balance the insulin dose you have been prescribed, or you may have an infection which increases the amount of glucose your body makes. These are just some possible reasons to think about. When you think you know why the glucose level is high, you should take action to reduce it to normal levels. You may need to increase your insulin level until the

blood glucose returns to normal, or you might need to reconsider the amount of carbohydrate you are eating. What you do will depend on (a) why it is high, (b) if it is high at the same time everyday, and (c) your weight - if you are overweight you should decrease the carbohydrate intake rather than increasing your insulin.

5. Not sure what do do?

If you are not sure about your blood or urine test result, that is, what it means, and what should you do, then do phone or come to the Diabetic Unit - Ward D7B - for advice.

6. Longer term assessment of diabetic control

There is a test which can show how well controlled you have been in the previous 6-9 weeks. This is called a HbA₁ test, or glycosylated haemoglobin test, and is carried out in the laboratory.

The test is a measure of the amount of glucose which has attached to the blood proteins - haemoglobin. This is really "sugar coated protein" - and the higher your blood glucose levels have been in those weeks, the larger the amount of these sugar coated proteins will be present. HbA₁ is a sugar coated protein which forms when the blood glucose is high - therefore the lower the amount of this HbA₁, the better the control has been. If the HbA₁ is high, it indicates that control has been poor.

Non-diabetics have some HbA₁ because everyone has a certain amount of glucose in the blood - the normal level is between 6-9% - therefore we should be aiming to mimic this and try to achieve levels of below 10% which would tell us that our control was satisfactory.

7. Why is good diabetic control important?

Good control is very important to avoid hypoglycaemic reactions or ketones, and also better control can help to reduce the long term complications of diabetes which can occur. You also feel better when you know your body is working well and you are in control.

- (1) ...
- (2) ...
- (3) ...
- (4) ...

WHAT TO DO

- (1) ...
- (2) ...
- (3) ...
- (4) ...
- (5) ...
- ** If your blood glucose is over 15.0 mmol/l then you should ... before watching the outcome.

WHEN TO DO IT ?

If you could test your blood ... at the times shown on the ... you can't change this, and you should ... test your blood at these times on 1 day ...

(1)

TESTING YOUR BLOOD GLUCOSE (SUGAR)

GETTING BLOOD !

- (1) Warm your hands first - but make sure they are dry.
- (2) Take the lancet and quickly prick one of your finger tips.
- (3) Turn your hand over so that the palm is facing the floor.
- (4) Now the blood should form a 'blob' and is ready to place onto the test stick.

WHAT NOW ?

- (1) Place this drop of blood on the pad on the end of the 'BM' stick - but do not smear it on.
 - (2) Wait 60 seconds - use a watch or clock.
 - (3) Wipe the blood off the stick with cotton wool or a tissue.
 - (4) Wait 60 seconds - again.
 - (5) Now match the colour of your test stick with the colours on the bottle, and you will know what your own blood glucose (sugar) level is.
- ** If your blood glucose is more than 13.3 mmol/l then you should wait an extra minute before matching the colours.

WHEN TO DO IT ?

If you could test your blood 2 days every week at the times shown on the next page - great! You may find you can't manage this, and you could perhaps test your blood at these times on 1 day every week.

BEST TIMES TO TEST YOUR BLOOD

1. before breakfast
2. 2 hours after breakfast
3. before lunch
4. 2 hours after lunch
5. before evening meal
6. before bedtime snack/supper

Take care to keep the lid on your bottle of test sticks and keep them in a dry place.

YOUR BLOOD GLUCOSE LEVELS

You should aim to keep your blood glucose level between 4.4 and 10 - these levels are shown in brackets on the side of the BM stick container.

BEFORE MEALS

It is better to have blood glucose levels between 4.4 to 6.7 because you will be eating more carbohydrate which will increase the blood glucose further.



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SESSION NUMBER: 6

Topic: HYPERGLYCAEMIA AND KETONES

Time: 1 hour

Format: Group

Resources: Slides - hyperglycaemia and ketones
Ketostix test strips

Aims:

To explain what hyperglycaemia and ketones are. To emphasise the importance of avoiding these and to discuss appropriate actions to take when these occur.

Objectives:

That the patient will be able to:

1. Distinguish between the terms 'hyperglycaemia' and 'hypoglycaemia'.
2. Explain what is meant by hyperglycaemia.
3. State the common symptoms of hyperglycaemia.
4. Describe the appropriate steps to take in order to regain normoglycaemia.
5. Explain what 'ketones' are and why they occur.
6. Explain what the presence of ketones indicates.
7. State the symptoms of ketonuria.
8. Demonstrate the correct testing procedure for ketonuria.
9. Describe the appropriate action to take if ketonuria occurs.

10. Demonstrate an appreciation of the dangers associated with ketones, the times when ketone formation is most common, and the importance of avoiding ketones.

STRUCTURE OF PRESENTATION

Transition:

Patients were informed of their HbA_{1c} test result from the previous month; this was interpreted and discussed and provided feedback and encouragement. To ensure an adequate understanding of the concept of 'diabetic control', presented in the previous session, several questions were asked and subsequently discussed, e.g.

1. What is an acceptable range of blood glucose concentration?
2. Is it normal to have glucose in the urine?
3. What does it indicate if your blood glucose level is more than 13 mmol/l?
4. What would you think and do if your blood glucose level was greater than 13.3 mmol/l every evening before your second injection?

Content:

The term hyperglycaemia was defined and distinguished from hypoglycaemia. The structure and content of the session was outlined; therefore patients were able to anticipate the presentation of the information.

The role of insulin in controlling carbohydrate metabolism was revised, and the adverse effects of insufficient insulin were explained.

The symptoms of hyperglycaemia were described. The possibility of poor control without symptoms was emphasised to enhance the value and importance of blood and urine tests, and HbA_{1c} tests, to ensure good control.

The various causes of hyperglycaemia were discussed and the possible strategies to reduce this were considered, including increasing insulin dose, reducing carbohydrate intake, altering the types of carbohydrate and increasing the interval between injection and meal times.

The relevance of hyperglycaemia in the development of chronic complications was described and the importance of avoiding chronic hyperglycaemia was emphasised and encouraged.

Patients were encouraged to follow the advice given and provided with further support from the Diabetic Unit.

Ketones were defined and their significance in indicating poor glycaemic control was explained. Most common reasons for the formation of ketones and how this occurs was described.

The test for ketones using 'ketostix' was demonstrated, and other signs and symptoms of ketonuria were described.

Much emphasis was placed on the need for immediate action when ketones appear, and patients were encouraged to increase insulin doses appropriately and/or contact the Diabetic Unit or their G.P. for further advice. The dangerous aspects of ketones were emphasised, thereby encouraging immediate action by patients.

Patients were asked to relate their own experiences concerning hyperglycaemia and ketones, and in particular to describe the possible acute onset of ketonuria and its effects on the body.

Summary:

The information was summarised by a list of key facts:

1. Hyperglycaemia is a high blood glucose concentration.
2. This can be caused by eating too much carbohydrates, too little insulin, infection or other illness and stress.
3. You may feel tired, thirsty and pass more urine than normal.
4. You should ask yourself 'why' is your blood/urine glucose level high - then take action.
5. Either increase your insulin or decrease your dietary carbohydrate.
6. Ketones are substances produced in your body when fats are broken down. This is because there is not enough insulin to give the energy needed by the body.
7. Ketones are carried in the blood; they are toxic substances and may be dangerous for the organs of your body.
8. You may feel sick and vomit and have cramps. You might be able to smell acetone/pear drops on your breath and you can also test your urine for ketones.
9. Take immediate action - increase your insulin dose until they disappear - phone the diabetic Unit for advice.
10. Illness is the most common time that ketones develop - therefore test blood/urine glucose more often and check for ketones when ill.

Discussion:

The groups were asked questions in order to encourage consideration and application of the information presented:

1. When might hyperglycaemia occur?
2. Does a high blood glucose matter for a short time?
3. When might ketones develop?
4. Why is it important to get rid of ketones quickly?
5. What would you do if ketones were present in your urine?

Motivational Aspects:

Feedback and achievement factors were introduced by providing the HbA_{1c} results from the previous month. Group discussion enabled patients to relate their experiences of hyperglycaemia and ketones, and therefore reinforce the learning process. Reassurance and support were provided by the availability of the Diabetic Unit.

Evaluation:

All patients knew about hyperglycaemia, but many related it to the time of diagnosis of diabetes. Many patients admitted being hyperglycaemic often but without any symptoms. Very few patients had considered increasing insulin doses if the blood glucose was high, but would decrease their carbohydrate intake. Most patients believed that having a high blood glucose for a few days wouldn't matter too much.

Most patients had heard of ketones but few knew what they were and why they occurred, or the dangers associated with them. Most

patients had experienced ketones either at diagnosis or otherwise, and could give detailed accounts of the symptoms experienced. Very few patients knew what to do if ketones developed, and it did not appear to be a particularly important aspect in diabetes management.

Peer group discussion concerning personal experiences enhanced the belief that having ketones was a particularly bad experience and reinforced the ways to avoid the development of them, particularly in illness.

HYPERGLYCAEMIA AND KETONES: - Script

Note: Slides used in the session are illustrated in Figs S20 and S21 following the script shown here.

A. HYPERGLYCAEMIA

1. What is hyperglycaemia?

Hyperglycaemia is opposite to hypoglycaemia and it is a high blood sugar and may be a result of not enough insulin or too much dietary carbohydrates.

2. How does this happen?

Your body needs insulin to allow the glucose you want and need to use for energy, to get into the cells and be used. The glucose you eat can't be used unless it can get into cells first. So if you don't have enough insulin, as would be the case if you missed an insulin injection, then there is not enough insulin to get this

glucose you have eaten into the cells. If you do have the correct amount of insulin but you eat too much - have a binge - then you haven't got enough to let all this glucose into the cells.

3. What happens to the extra glucose?

The glucose (sugar) which doesn't enter your cells now floats around your body like a 'Tate & Lyle' factory and your body will try and dispose of it through the kidneys in the urine, and this will be one of the obvious symptoms when you are hyperglycaemic.

4. What are the signs of hyperglycaemia?

This is not all it does to your body, but there are warning signs - very different than in hypos, and these will tell you your blood sugar is high. These include feeling thirsty, passing a lot of urine, and feeling a bit sick. You will be more prone to developing infections easily, some people even get cramps and blurred vision, and you may notice a burning feeling when passing water, particularly women.

Some of these symptoms may appear quickly or may develop over a few weeks if you are badly controlled for a while. These effects on your body are going to be a strain on your kidneys and blood vessels - the thick glucose in your blood - this will not do your body any good.

5. What can you do?

There are various reasons why you have a high blood glucose so you have to decide why you are hyper first - then you can do something about it.

If you are overeating, cut down and stick to your diet or if you find you are hungry then see the doctor and tell him you need to eat more - he may raise your insulin to cope with this. But weight is also very important and so if you are overweight, this is not the answer - cut down the carbohydrates and eat bulky foods like fibre, apples, etc.

Perhaps you haven't enough insulin - then you should phone the Diabetic Ward; you may need to take extra insulin. Perhaps you are ill or worried and this can cause your blood sugar to rise sometimes.

Don't be afraid to increase the insulin - but only 2 or 4 units at one time. If you are on 2 x daily injections then decide which part of the day you are hyper - and then change the necessary insulin.

If in doubt phone D7B.

6. Monitor your blood glucose and urine. Do make sure that your blood sugar does return to normal - don't wait until your next appointment if it is very high. Check it doesn't get worse.

B. KETONES - Demonstration of ketone testing.

Provision of ketostix

1. What are ketones?

There are layers of fat under the skin all around your body and these fats can be broken down in the body to give you energy. Now when there is not enough insulin to let sugar get into your cells, then they want some energy from somewhere. This then comes from the fats.

2. This sounds like a good idea, but there is a big problem - to break down this fat around the body properly and use it you need insulin. So instead of giving lots of energy like they could do, the fats make ketones instead because of the low amount of insulin.

3. How do you know you have ketones?

These ketones are substances in your blood and they will then appear in the urine - they are not wanted in the blood so you try to flush them out with the urine like unwanted glucose (sugar). When this happens and you can smell ketones - this is a fruity pear-like smell on your breath and urine - this will tell you that your diabetes is not well controlled.

4. Ketones in your body isn't pleasant because you often feel sick and may even vomit, and you may have cramps.

5. What to do?

Well, it is important to know how to test for ketones and this is very easy and can be done with ketostick - demonstrate. You should always test for ketones if (a) you feel unwell and (b) you have a high blood sugar.

6. Ketones may be present, so you must do something to get rid of them quickly. You will need to raise your insulin by 4 units at the next injection and by another four at the following one until your urine is free - negative for ketones. Then your body will feel more normal and you can reduce the insulin down to your normal dose again. Keep checking the urine for ketones and blood sugar. If you find that there is a high ketone level, then you should phone the Diabetic Ward immediately, or your own doctor - they will advise you.

7. When you are ill and do feel sick you may notice that the blood sugar is high and it is a good idea to test for ketones - it may be that which is making you feel ill.

8. Discussion and assess understanding.



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SESSION NUMBER: 7

Topic: EXERCISE AND ILLNESS

Time: 1 hour

Format: Group

Resources: Slides - exercise and illness
Information sheets (GMC)

Aims:

To describe the effects of illness and exercise on blood glucose concentrations, to provide appropriate advice concerning adjustments in diet and insulin, and to encourage the maintenance of continued diabetic control.

Objectives:

That patients will be able to:

1. Explain the possible effect of illness on blood glucose concentrations.
2. Describe appropriate adjustments in insulin dose if this is required.
3. Demonstrate confidence to adjust insulin dose when necessary.
4. State the acceptable dietary modifications sometimes necessary in illness.
5. Appreciate the importance of frequent blood and urine testing to monitor glucose and ketones.
6. Appreciate the need to control blood glucose levels to avoid ketones and further infection.

7. Describe the after-effects of exercise on the blood glucose concentration.
8. Describe the type of modifications which can be made to diet and insulin in order to avoid hypoglycaemia.
9. Appreciate the value of blood glucose tests before and after exercise.
10. Appreciate the benefits of exercise in decreasing blood fats and risk of heart disease, improving general health and potential improvements in blood glucose control.

STRUCTURE OF PRESENTATION

Transition:

Patients were informed of the previous HbA_{1c} test result. This was compared with previous measurements and the individual patient's glycaemic control was discussed. To relate the information of the previous session to the current subject, several questions were asked in order to enhance the recall of information and ensure adequate understanding.

1. What are the most common causes of hyperglycaemia?
2. Does a high blood sugar matter?
3. What does ketones in the urine indicate?
4. What would you do if your blood glucose was more than 13 mmol/l and there was a moderate amount of ketones in your urine?

Content:

Patients were informed of the content and structure of the session, enabling organisation of the information into categories to facilitate learning.

The hyperglycaemic effect of infection and illness was described, and the frequent requirement of increased insulin dose, rather than reduced dose, was emphasised. Adjustment of insulin dosage during illness was discussed, and consideration was given to each individual's insulin regime.

Appropriate advice was given in the event of poor appetite in illness, and some of the common 'sick foods' were recommended. The need for carbohydrates, despite poor appetite, was explained briefly.

The association between illness and ketones was introduced, and the usefulness of urine/blood tests was discussed.

The importance of maintaining reasonable blood glucose levels throughout illness was stressed, in order to avoid ketone formation.

The possible hyperglycaemic effect of stress was explained simply, and patients were advised to avoid conditions of long-term stress and worry.

Patients were asked to share their past experiences concerning illness.

The effect of exercise on blood glucose concentrations was considered, emphasising the hypoglycaemic after-effects which can occur, the increased insulin receptor activity, and the greater flow of blood and insulin to the tissues.

The possible benefits of exercise were outlined, including improved glycaemic control, decreased blood lipids and better general health. Patients were encouraged to take some form of exercise.

The dangers of exercise-induced hypoglycaemia, particularly several hours post-exercise, were explained, and appropriate advice was given on ways to avoid this, e.g. increase carbohydrates and/or decrease insulin dose.

The value of blood tests after exercise was emphasised in order to avoid hypoglycaemia.

Personal experiences regarding exercise and its effects were discussed.

All patients were provided with an information sheet (Fig. S22) to reinforce the information presented.

Summary:

The information was summarised by verbally reviewing the key facts presented in the session:

1. Illness can cause your body to produce more glucose therefore causing hyperglycaemia.
2. NEVER stop or decrease your insulin, you may need to increase it.
3. Eat the same amount of carbohydrates - if you have no appetite you may need to have 'sick foods' such as sweetened drinks, biscuits, etc.
4. Test your blood and urine for glucose and ketones.
5. Don't put yourself under great stress and worry¹ - it may affect your control.
6. Exercise lowers the blood glucose, particularly several hours after exercising.

7. Take extra carbohydrate or reduce your insulin dose if you are taking severe physical exercise or activity.
8. Exercise can help your diabetic control, it will lower the fats in your blood, helps to keep your weight stable and makes you feel better.

Discussion:

Several open-ended questions were asked to the group. These were intended to encourage group participation whilst considering the information presented:

1. If you had the flu and had lost your appetite, what would you do?
2. When you are ill, what should you check your urine for and why?
3. What are the benefits of exercise?
4. What could you do to avoid going hypo after severe exercise?

Motivational Aspects:

Feedback was provided with HbA_{1c} test results from the previous session, thereby providing feedback concerning glycaemic control. The group format allowed discussion which enhanced reinforcement of learning and of the practical application of the information. Information sheets served as reminders of the key facts concerning exercise and reinforced the benefits of this.

Evaluation: Based on all groups

Most patients had experienced increases in blood glucose levels

during illness, but very few had considered increasing their insulin dose to counteract this. A number of patients admitted that they had previously decreased their insulin if they had a poor appetite - despite the symptoms of hyperglycaemia being present. Several patients had developed ketoacidosis during illness, particularly infections, and therefore demonstrated the association between these two.

Most patients were fairly active and all knew of the hypoglycaemic effects of exercise. Some had experienced severe hypoglycaemia several hours post-exercise, and therefore were able to reinforce the information and advice given. Very few patients had considered decreasing their insulin dose to cope with exercise, despite continued hypoglycaemic effects.

Group discussion was generally good, particularly concerning inter-current illness and its effects.

EXERCISE AND INTERCURRENT ILLNESS: - Script

Note: Slides used in the session are illustrated in Figs. S23-S25 following the script shown here.

(A) Intercurrent illness or infection

1. When you get the flu or another infection, your body tries to fight the flu or infection and this can make you very drained and tired because the cells in your body are attacking the infection.

2. Being diabetic, however, there is an additional problem - a cold, flu or other infection attacks your body so that the insulin is not as active as it should be - some of the insulin action is decreased. This then means that more insulin may be needed in times of illness.

3. To find out what your blood sugar is, you should test your blood (urine) and if this is higher than normal levels, then more insulin should be taken.

4. You may say you don't feel like eating and therefore shouldn't you decrease your insulin. NO - you still need insulin in your body, and you must eat your portions or exchanges, perhaps in a different form, i.e. sick foods like orange juice, custard, Lucozade.

5. How much insulin? This can be increased by 4 units at the first injection, then if the blood sugar is still very high raise it by another 4 at the next injection - giving 8 units extra. The blood glucose should have decreased by now and you should be seeing near normal values. The advantages of blood testing can come in here.

6. Never stop your insulin - or reduce it when ill. The insulin is less active, so even if you eat less you may need more insulin.

7. Foods you normally eat may not be any use when you are ill and being sick - so use sick foods such as custard, milk, soup, Lucozade, orange juice.

8. You now know about ketones and what these are and these can also appear in your urine when you are ill and your diabetes is gradually

becoming less well controlled. You must test for ketones when you are not well. If ketones are present, you will surely need extra insulin - and again you should raise it by 4 units at a time until ketones have gone from the urine.

The importance of testing blood and urine is seen here. Insulin should be returned to normal gradually when the ketones disappear and blood sugar is normal.

9. Does it matter if your blood sugar is high just for a few days? YES - because when the blood sugar is raised then you are more prone/vulnerable to infections, you are also more likely to develop ketones with a high blood sugar which means the diabetes is then out of control.

10. Worry and stress are not good for anyone but particularly if you are diabetic because this can raise your blood sugar - don't become too anxious about things and particularly not diabetes.

(B) Exercise

1. Exercise is a great way to burn off the excess fuel in the body and the first one to be used is glucose in the blood.

2. Being diabetic, the glucose you have in your blood is that which has come from the starches/carbohydrates you have eaten, and is just enough (or should be) to match the insulin you have injected. This then means that any extra exercise you will be doing needs extra glucose. So you should eat 1 or 2 extra portions before doing extra activity.

3. How much more carbohydrate do you need? This will depend very much on what you will be doing and how long for. You don't want to overload yourself too much because this will mean you have a high blood sugar for several hours if you haven't used it all up.

It is very much trial and error, but 2 extra portions or exchanges is enough for most people to start off with and then if you need something in-between, have something sweet available. If you are doing something very strenuous then between 2-5 extra portions or exchanges might be needed. Biscuits are a good way to take the portions and then if you need extra, have something like orange juice or dextrosol around.

4. Your body also makes some glucose of its own when doing exercise - so be careful not to over-indulge.

5. If you know you are going to be very active (particularly young ones), then you might wish to reduce your insulin instead - you could reduce it by 4 units and then you don't need to eat quite so many portions, especially if you are concerned about weight.

6. What do you count as extra activities? Well, playing any sport, gardening, decorating, shopping, spring cleaning, etc. All these might need extra carbohydrates. Discuss.

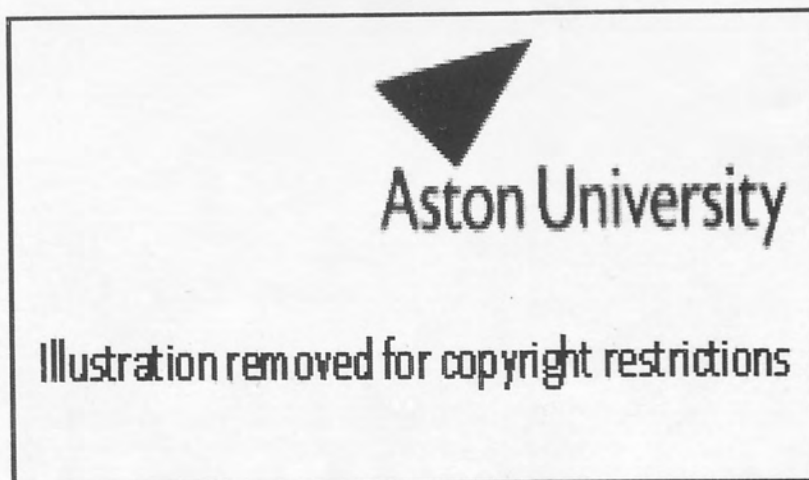
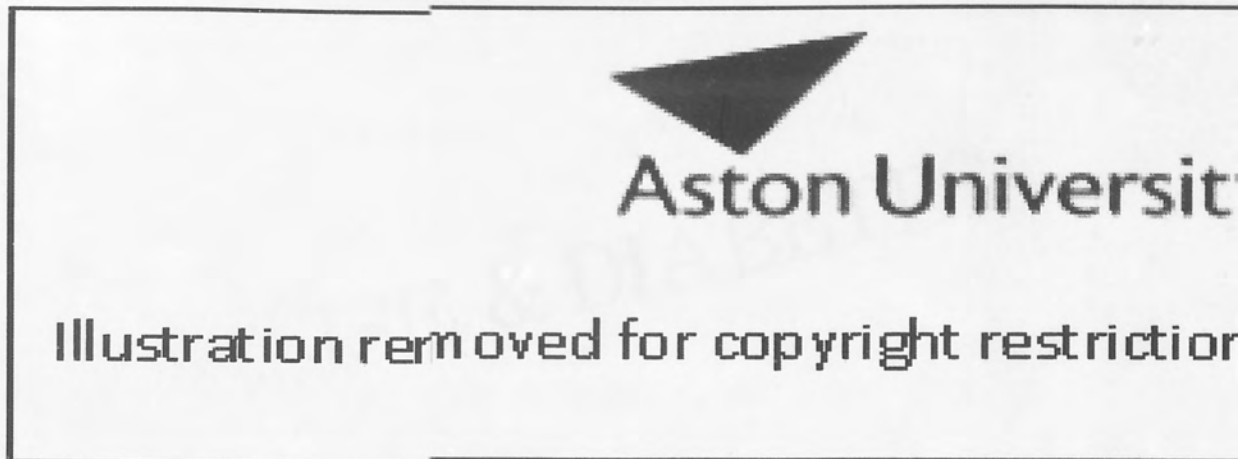
7. What about exercise and diabetic control? Exercise has many benefits for diabetic people because any excess glucose in the blood is burned up (provided there is not ketones as well). It also increases the absorption of insulin from the injection site and so keeps the blood sugar lower. The glucose (carbohydrate) eaten at

meals is then used up (enters the cells) more quickly after activity and more normal or near normal blood sugar levels can be achieved.

There are other benefits such as the toning of muscle, improved heart rate and reducing weight -- and keeping you generally more fit.

EXERCISE & DIET

Fig. S22 Information Sheet concerning exercise and insulin-dependent diabetes





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SESSION NUMBER: 8

Topic: PRACTICAL ASPECTS OF DIETS

Time: 1 1/2 - 2 hours

Format: Large mixed group - 8 - 12 patients

2 or more dietitians

1 nurse

1 educator

5 or more relatives or friends

Resources: Buffet meal plus wine

Aims:

To illustrate the dietary recommendations in a practical setting where various aspects of diet and diabetes could be considered, and where patients actively participated in the learning process.

Objectives:

That patients will be able to:

1. Demonstrate an adequate understanding of the carbohydrate exchange system.
2. State the carbohydrate value of the most commonly used foods.
3. Describe various ways to decrease fat intake and why this is important.
4. Describe various high fibre food sources and the benefits of these on glycaemic control.
5. Demonstrate an understanding of the carbohydrate measurements on food labels.

6. Explain the effects of alcohol on blood glucose concentration.
7. State the most suitable alcoholic drinks for diabetics and how to treat these with regard to carbohydrate values.
8. Demonstrate confidence to exchange and vary the carbohydrate sources in meals.

STRUCTURE OF PRESENTATION

Transition:

Results of the previous HbA_{1c} tests were given to each patient.

Content:

A buffet meal was provided either as lunch or the evening meal. Between 8-12 patients attended each meal, 2 or more dietitians were present and one staff member from the Diabetic Unit. Patients were invited to bring a relative or friend along.

The meal was served in a large room away from the hospital environment, music was played and one large table seated patients in a large group - thus enhancing social aspects to the session.

Patients and the rest of the group served themselves from a selection of cold dishes, including starters, main savoury dishes and sweet dishes. Members of the group were asked to at least try dishes they were unfamiliar with. Various sources of carbohydrate were offered, including bread, rice, fruit, yoghurt and ice-cream.

The group were seated around the large table and relevant discussion was prompted by the dietitians, educator and nurse.

The carbohydrate content of various dishes was discussed and the fat content of foods and ways to decrease fat intake was considered. The value of fibre dishes to add variety to meals and also help post-prandial glycaemia was outlined. Various dishes were described by the dietitians.

Alcohol and its effects on glycaemia was described. Suitable drinks were listed and how to regard their carbohydrate content was explained.

The importance of controlling weight was emphasised, and the best ways to achieve this were outlined.

Smaller group discussions developed with dietitians, nurse and educator dispersed amongst patients. Various individual questions were answered.

Discussion:

Several questions concerning diet were asked to the group in order to prompt and encourage a larger group discussion/debate:

1. What is the carbohydrate value of a small portion of bean salad?
2. How much rice would be equivalent to a 10 g carbohydrate exchange?
3. Would you need to count fruit as carbohydrate?
4. Do any meats have carbohydrate in them?
5. Is there any carbohydrate in the wine we are drinking?
6. Is there any carbohydrate in any wine?

Motivational Aspects:

Free buffet meal plus wine

Social occasion

Active involvement in learning

Increased attention and communication with dietitians

Immediate feedback to questions/problems

New imaginative meal ideas

Feedback provided by the HbA_{1c} results.

Evaluation: Based on 4 group buffet meals

This was a very successful and practical way to illustrate and consider diet.

Initially, patients were very reserved and rather unsure of some of the foods presented. However, much discussion was stimulated by some of the newer bean dishes. Patients seemed very unsure of the carbohydrate value of most foods served, and many took their carbohydrate exchanges as bread rather than other sources such as rice, fruit or yoghurt.

Most patients appeared to enjoy the food, but were under the impression that it was expensive. This was discussed by the dietitian and prices were estimated.

Wine was a treat for most people and certainly enjoyed, and was particularly important in enhancing the social aspects of the meeting. It was apparent that there was much confusion and uncertainty concerning the carbohydrate value of alcohol. Most

patients thought alcohol would increase the blood glucose concentrations.

A particularly important feature of these meals was the participation of the patients' relatives or friends who attended. This reinforced the concept of a 'healthy diet' rather than that of a 'diabetic diet', and again added to the social atmosphere.

This session was an enjoyable way to reinforce and revise dietary information presented in Session 2.

Aims:

To ensure that patients are informed and reassured about the more common complications of diabetes, and are aware of the increased risks of these with poor glycaemic control.

Objectives:

That patients will be able to:

1. Describe in summary the major complications associated with diabetes.
2. Describe which parts of the body can be affected and how.
3. Explain some of the factors which may decrease the risk of developing some of these complications, e.g. good glycaemic control, foot care, regular eye checks, weight control.
4. Show an awareness of the increased prevalence of heart disease in diabetes.
5. Explain the most important steps when aiming to reduce the risk of heart disease, e.g. low salt, low fat diet, no smoking, weight control.

SESSION NUMBER: 9

Topic: COMPLICATIONS OF DIABETES

Time: 1 hour

Format: Group

Resources: Slides - complications of diabetes
Teaching model

Aims:

To ensure that patients are informed and reassured about the more common complications of diabetes, and are aware of the increased risks of these with poor glycaemic control.

Objectives:

That patients will be able to:

1. Demonstrate an awareness of the major complications associated with diabetes.
2. Describe which parts of the body can be affected and how.
3. Explain some of the factors which may decrease the risk of developing some of these complications, e.g. good glycaemic control, foot care, regular eye checks, weight control.
4. Show an awareness of the increased prevalence of heart disease in diabetes.
5. Explain the most important steps when aiming to reduce the risk of heart disease, e.g. low salt, low fat diet, no smoking, weight control.

6. Demonstrate a less fearful attitude towards the complications of diabetes.
7. Express a positive attitude to health care, aiming to reduce the risks of these complications.

STRUCTURE OF PRESENTATION

Transition:

Several minutes were spent discussing the buffet meal attended at the previous session. Patients were asked to express their likes/dislikes of the various dishes, and to comment on the educational value of the session.

Content:

The subject of complications was introduced and patients were reassured by stressing the point that complications were not an 'inevitable fate'.

The eyes were considered with regard to retinopathy, cataracts and blurred vision. An accurate, but simple, account of retinopathy was given. Although the importance of better glycaemic control was stressed, attempts were made to ensure that patients did not regard retinopathy as a long-term threat.

Nephropathy was discussed very briefly. Again the relationship between good glycaemic control and reduced risks was emphasised.

The common neuropathic problems which occur in the legs and feet were described, and the common symptoms and appropriate actions were

discussed. Patients were advised on foot care and the reasons behind this.

The association between poor glycaemic control and the development of some complications was stressed. Patients were encouraged to aim for the best possible control. The changes which have taken place in diabetes management over the previous 10-20 years were outlined to emphasise the greater opportunity which exists to achieve good glycaemic control.

Macrovascular disease and the associated risk factors were described. Ways to reduce the risk of heart disease were discussed, e.g. no smoking, weight control, dietary habits.

The session concerning complications was designed to be informative and interesting, but it was not intended to serve as negative reinforcement or threat, but rather to reassure and encourage patients.

Summary:

Information was summarised by stating the key points considered:

1. There are certain complications which are associated with diabetes.
2. These can affect the eyes, kidneys, legs and feet.
3. Achieving good diabetic control may help to prevent some of these problems.
4. Heart disease is more common in people with diabetes.

5. A low salt/low fat diet, no smoking, good weight control may help to reduce this risk.
6. Think positive - don't worry about complications, follow the advice to prevent or reduce them.

Discussion:

This was encouraged by asking several questions concerning patients' beliefs about complications:

1. Do you think of complications when your control is not good?
2. Does retinopathy mean you 'will' go blind?
3. Does the thought of complications depress you?
4. Would you rather not know about complications?

Motivational Aspects:

By providing patients with information about what the complications actually are, reassurance was provided. The practical advice aimed to decrease the risks of complications served as motivators rather than threats. Peer group support was valuable in promoting less fearful beliefs about complications.

Evaluation:

Most patients knew that complications existed and that the eyes and feet could be affected. Few patients were aware that the kidneys could be affected, or how the eyes or feet were affected. The association between glycaemic control and complications were generally well known. Heart disease was not considered to be relevant by most patients, despite the increased risks.

The session was enjoyed very much and the patients were very eager to know about the complications.

COMPLICATIONS OF DIABETES: - Script

Note: Slides used in the session are illustrated in Figs. S26-S28 following the script shown here.

1. Introduction

Many people talk about 'long-term complications' of diabetes and make it sound like it is part of having diabetes - well it is not! Yes, it is true that being diabetic you are more prone to developing complications or problems affecting the eyes, kidneys, nerves and large blood vessels, but this 'great fear' of such problems has been exaggerated - simply because no one knew why they did occur more in diabetic patients. But it is important that you realise not everyone gets problems and that these can be delayed or prevented.

2. It is now known that some of the changes which take place in the eyes, nerves and kidneys to cause problems are related to high blood sugar levels and uncontrolled diabetes. High glucose levels in these parts of the body stops the normal processes and so this is where complications at these sites might start. Indeed, it would be sensible to presume that normal blood sugar levels would be less harmful and that is why doctors are now asking people to try and keep the blood sugar near to the normal level as much as possible.

3. An important point to remember now, is that much more is known about diabetes and how to achieve better control. Insulins are purer and have various times of action. Diet has become much clearer - and the value of fibre in decreasing the absorption time of the carbohydrate/starches which are digested. Blood testing allows you to see for yourself the effects of certain activities (like eating!), and enables management of diabetes much easier. Urine testing is less of a chore now, with simple dipsticks being used.

Many things have changed in the management of diabetes - more is known and so better advice is given so that you can prevent the suffering, and you don't need to be afraid of complications.

4. What about these complications of diabetes - What are they?

The first one I will talk about is the problem which can affect your circulation system, i.e. the large blood vessels. Whether you are diabetic or not, these can harden as you get older and a fatty layer can build up in the walls of these arteries. In later years there is a gradual 'clogging up' of the arteries with this fat, and this stops the blood from flowing freely as it should. This might cause you to develop a higher blood pressure and for some people when the blood cannot reach the heart properly, they have a heart attack or stroke.

I did mention earlier that disease, or rather problems with the blood vessels, can occur in anyone - diabetics and non-diabetics, but it must be stressed that there is a greater chance of this happening in diabetics and so it is even more important to look at ways to reduce this risk.

5. Well, it might be better to think about 'what causes this disease of the arteries and blood vessels'? There are four major factors which help in the changes which can take place in the vessels:

1. High fat levels in the blood
2. High blood pressure
3. Smoking
4. Obesity/overweight

6. So what can you do to reduce the risk of problems with your arteries. Diet is vital here because it can help with three of the risks/factors mentioned already:

- (a) Cut down on the fat you eat - including foods like fatty meats, butter, lard or oil, fried foods, cream, egg yolks, etc. This means there is less fat in your blood to build the layer of fat in the vessels. Lower fat levels will also help you to lose some weight.
- (b) Salt can help to raise your blood pressure so try and cut down on the salt - this might help to lower your blood pressure. Another factor which will raise your blood pressure is worry and stress - do make sure you relax and don't get upset so quickly - you know that this can also affect your blood sugar.
- (c) Smoking - this is a major risk with problems affecting the arteries. Smoking narrows the blood vessels and then interferes with the blood flow to the heart - and it is also related very much to other problems such as bronchitis and lung cancer, and it also affects diabetic control because of its effects on decreasing the absorption of insulin.

The ways to help yourself and your families are outlined here and if you can at least follow a few of these points, you will be helping yourself.

7. Eyes

You have probably heard people talking about diabetes and how it affects your eyes, but how and why? Well, there are several ways eyes are affected in diabetics-

(a) One of these is the blurred vision which happens sometimes when the blood sugar levels change. With a very high blood sugar you may have experienced blurred vision which disappeared when you were controlled. This can also happen when you have a hypo - you may find you can't focus properly. If this happens, do check your blood and if it continues see the doctor. Blurred vision is not permanent or harmful. Perhaps you may need stricter diabetic control.

(b) Cataracts is another problem with eyes - but it must be stressed that this also happens in non-diabetic patients. These are just small changes in the lens of the eye which then causes dimness in vision. This will be noticed straight away by your optician or doctor examining your eyes and this shows the importance of having your eyes checked regularly. What if you do develop this problem? There is a simple operation which removes these cataracts and there is usually no problems.

(c) Retinopathy - you will have all no doubt have heard of this disease or complication of the eye, and the fact that it is very much associated with diabetic patients. But, because this occurs more often in diabetics, it does not mean that all diabetics develop retinopathy.

Well, what is this mysterious diabetic retinopathy?

The blood vessels supplying your eyes are quite small and delicate and as you can imagine they are damaged very easily. If the blood sugar levels are high all the time, these small blood vessels could become weak and become thick and even develop blisters. These don't hold the blood properly and eventually the blood leaks out (escapes) and can affect your vision. The onset of this type of problem is slow and you wouldn't know - again the point being stressed is to make sure that you do have your eyes checked regularly, because if this retinopathy is detected in the early stages, it can be treated quickly and any further damage can be prevented. Even when people get eye problems or retinopathy, most people can be treated with special treatment at the Eye Hospital and they do not go blind. Things have changed very much - this treatment was not available up until recent years so that people who did get bad retinopathy may have lost their sight - but this is not the case now.

Finally, if you feel you would like to have your eyes checked, then ask in the clinic - it is your right!

8. Kidneys

There are also small blood vessels in your kidneys which can also be damaged with high blood sugar levels for a long time, i.e. with badly controlled diabetes. This again stresses the point about better diabetic control. Your kidneys have to last you a lifetime - just because they are not on show, don't treat them badly!

9. Legs and Feet

As mentioned before, the circulation might be poorer in your legs and feet than in a non-diabetic, and this may mean that cuts and sores around your legs and feet take longer to heal - so do be careful!

There are lots of nerves travelling along your legs and down through your feet - and some diabetics find that these nerves don't work properly, or as well as they should and they call this problem 'diabetic neuropathy'; you may have heard of this before. But it is not a common problem now because of the better control people achieve.

Why are the nerves affected? This is very similar to the way sugar affects the blood vessels of the eyes, but with neuropathy high sugar levels affect the nerves causing them to swell and not function properly.

What happens then? Well, if you think about what your nerves do you can see what happens when they don't work properly. The nerves carry messages from one part of the body to the next and give information about all the parts of your body, e.g. they tell your feet to move if you touch something hot. The nerves in your legs take messages to your feet and the nerves in your feet take back messages to your legs. Now, when the nerves are affected, they don't work properly - then these messages stop, they don't get to your legs or feet.

How do you know you have problems with your nerves? The muscles in the legs might begin to feel cramp-like pains because the nerves aren't working as they should, and if you ever feel pains like this you should tell the doctor at the next clinic appointment.

Again, controlling your diabetes means there won't be as much sugar around to cause any damage.

Feet - You may have been told to look after your feet because you are diabetic but never sure why. Well, your foot is the furthest point from your heart and, as mentioned before, your circulation might be poor - especially down as far as your feet. This means that any cuts or sores or infections will not heal as fast as they should.

Well, so what if it doesn't heal quickly? Then it is more likely to attract an infection here and that means it takes even longer to heal and it can also affect your diabetic control. Another problem is if there is high sugar levels - this will attract bacteria to the sore or cut - so please be careful!

It is wise to make sure you look after your feet - you need them until the end of the road.

Another problem with a diabetic person's feet is that the nerves might not be working as well as they should, i.e. they are slightly damaged and when you bang/knock/injure/burn your foot, you may not feel it and might not even dress it or see a doctor. An example of this, where you really must be careful, is near a fire or hot water bottle - you don't feel the heat or even know you are burning your foot. Be careful! You might even say, "well I haven't got neuropathy - my nerves are fine so I would feel it" - but it is wise to get into the habit of being careful and do try and follow the advice here.

10. DO'S

Wash feet daily

Dry properly

Inspect them often

Change socks/tights daily

Cut toe nails straight across

If eyesight poor - see a chiropodist

Wear good fitting - comfortable shoes

Show the doctor any sores or infections on your feet

DON'TS

Walk barefoot

Put feet near fire

Use a hot water bottle without a cover

Never cut corns yourself

Wear tight shoes.



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SESSION NUMBER: 10

Topic: NEW DEVELOPMENTS IN DIABETES

Time: 1 hour

Format: Group

Resources: Slides - new developments
Insulin infusion pump

Aims:

To inform and update patients about the various research interests in diabetes, and to discuss the progress of various treatment and prevention methods being developed.

Objectives:

That patients will be able to:

1. State the major areas of research at present, i.e. insulin infusion pumps, artificial pancreas.
2. Describe the function of the subcutaneous insulin infusion pump, and the advantages and disadvantages.
3. Discuss the merits of insulin therapy and the advances in recent years.
4. Demonstrate acceptance of insulin therapy and enthusiasm to maximise its treatment outcomes.

STRUCTURE OF PRESENTATION

Transition:

Patients were informed of their previous HbA_{1c} result and these were discussed briefly.

Several questions were asked concerning the previous session - complications of diabetes. This was intended to enhance recall and reinforcement of information and encourage discussion:

1. Which parts of the body may be affected by diabetic complications?
2. What could you do to reduce the risk of a heart attack?
3. Does diabetic control matter?

Content:

The subject of new developments was introduced by asking patients what they had read or seen on television concerning diabetes research. Patients were encouraged to express their thoughts and beliefs about the ideas they had seen or heard about.

The artificial pancreas was illustrated using slides and the design principles were described. The advantages and problems associated with this method were explained.

Insulin infusion pumps and their function were described. An insulin pump was shown to patients to illustrate the size of the pump. Advantages regarding glycaemia were emphasised, and the disadvantages were discussed.

Transplant methods in diabetes were explained with respect to pancreatic and islet methods. The planning methods involved and the prognosis after transplants was discussed.

Patients were reassured that research was a continuous process and that steady progress was being made towards developing future therapies/prevention.

Patients were reassured of the benefits of insulin therapy and the progress which has been made, and the possibility of achieving adequate glycaemic control with insulin therapy was emphasised.

Summary:

The information was summarised in a series of statements:

1. The main research areas are: insulin pumps, artificial pancreas.
2. There are many problems which prevent the use of the artificial pancreas or the success of transplants.
3. Insulin infusion pumps are now being used - these are worn on the outside of the body.
4. You still have a diet and must test your blood regularly with a pump.
5. Pumps can help to achieve better diabetic control.
6. Research for better treatments, cures or prevention of diabetes continues all the time.
7. Insulin therapy has improved and good control is possible with your efforts.

Discussion:

Group discussion was encouraged by asking patients for their opinions on the different research areas considered.

Motivational Aspects:

Results of the previous HbA_{1c} test were given and which provided a source of feedback.

Patients were reassured that great efforts were continuously directed into research on treatment and prevention methods for diabetes. Reinforcement and encouragement was given to maximise the benefits of insulin therapy to achieve better control. Group discussion enabled patients to express their own ideas and feelings concerning new developments.

Evaluation:

Patients were very eager to know more about research developments and some were frustrated that no alternative to insulin therapy was available yet. Most patients liked the idea of the artificial pancreas, but were surprised at the sort of problems which occur. Transplants did not appeal to most patients, although interest was shown in the methods and problems of transplants. Insulin infusion pumps stirred great interest, but also disappointment because many patients believed that pumps did much more than just deliver insulin, and that diet and blood testing would not be necessary. Group discussions revealed that most patients were content with insulin therapy unless there was a treatment which did not require dietary restrictions.

Patients were not too optimistic about the future therapies which perhaps enhanced their efforts with insulin and dietary therapy.

NEW DEVELOPMENTS IN DIABETES: - Script

Note: Slides used in the session are illustrated in Figs. S29 and S30 following the script shown here.

Introduction

You have all been taking insulin for some years now and you sometimes hear people talking about a programme they have seen on television or something they have read about a 'cure for diabetes' and you might wonder where is this cure or alternative treatment for diabetes. In the news you hear of artificial pancreas, insulin pumps or pancreas transplants - what are they and when will they be in use?

Well, I am going to take each one and tell you about it and mainly what the problems are.

1. Artificial pancreas

(a) Well, you know the size of the pancreas and where it fits into your body, and you might imagine that the artificial pancreas is a bit like your own, only it is a machine. Well it isn't, because of the large size of the machine it is impossible to move whilst using this.

(b) Well, how does this work?

It is made up of 3 main pieces - 1. there is the part which tests the blood for glucose, 2. this then sends the message to the

computer part which works out how much insulin is needed and then tells 3. - the insulin pump to pump in a certain amount of insulin.

(c) What are the problems?

(i) There are many problems associated with this, the main one is the size of the machine. This means that the patient has to remain still.

(ii) The machine is able to test the blood continuously to let the computer know what the blood glucose level is. This then means you would be continuously losing blood!!

(iii) The machine would have to be connected to your body and this would mean tubes in your veins to test the blood, and another tube into your body to let the insulin in. This is very awkward and may increase the risk of infections.

(iv) The machines, as you would imagine, are very expensive and so far have only been used in experiments and special cases like surgery.

Discussion - Ask patients for their thoughts on the artificial pancreas.

2. Insulin pumps - Demonstration

This is a machine which pumps small amounts of insulin into your body throughout the day and night. It does not have any device to test the blood or tell you how much insulin you need, so you still have to do this. The pump is next to your body all the time and it can be strapped to your waist, arm or leg.

How does it work?

The insulin is put into a reservoir-like syringe on the machine and the doctor will set the machine so that it pumps out insulin at a set rate - e.g. x units per hour. The insulin moves through the tube - called a cannula, and then into your fatty layer, usually in the stomach. At meal times the machine can be programmed or switched manually to give a boost of insulin.

What if it fails?

There is an alarm on it so that if it stops or the batteries are low it will bleep. But this is one problem some machines have - because they don't always let the person know.

Problems?

1. Bulky and awkward - especially for women
2. Still must do blood glucose tests
3. Change the cannula (tubing) every 2 days
4. Refilling with insulin - a bit fiddly
5. Must remove it when having a bath or swimming
6. Tubing falling out of fat
7. Batteries failing
8. Expensive.

Advantages:

Gives very good control of blood glucose - because it is continuous infusion, therefore prevents the usual peaks of hyperglycaemia or troughs of hypoglycaemia which occur.

3. Transplants of pancreas or insulin-producing cells

Some people thought that this could be a way to cure diabetes but despite much research work little success has occurred with transplanting the pancreas or cells which produce insulin.

How do they do it?

A pancreas transplant means that a pancreas is removed from someone who has just died and is then placed into the diabetic person - so that it would produce insulin and act like the patient's own pancreas.

Problems?

It does sound a good idea but there are some major drawbacks which haven't been solved yet:

- (a) rejection of tissue - cells of pancreas die
- (b) major surgery involved - the pancreas produces other substances for digestion.

Transplants of cells producing insulin (islet transplants)

There is only a small part of the pancreas which produces insulin and so it would seem sensible just to remove that bit which is wanted.

How?

The cells in the pancreas which produce insulin are removed from a donated pancreas and placed in the diabetic person - these are then 'supposed' to produce insulin as normal.

Problems?

1. The cells are very small and delicate so to remove them and implant them so that they still work is very difficult.
2. They can't get enough of the cells from a pancreas to secrete enough insulin.
3. The cells are rejected again because they are from a different body - the cells die.

What now?

Well, we have seen various types of 'new devices' for treating diabetes but clearly they aren't satisfactory yet, and may not even appeal to you anyway.

The thing to do now is make the most of the treatment we have and try to achieve good control this way.

Group Discussion - the alternatives to insulin injection.



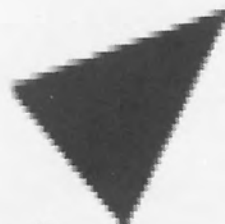
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SESSION NUMBER: 11

Topic: PRACTICAL PROBLEMS IN MANAGEMENT OF DIABETES

Time: 1 hour

Format: Group - 3 to 7 patients

Resources: Driving licence
Blackboard and chalk
NHS prescriptions exemption certificate
E111 insurance form
Insulin carrying cases

Aims:

To ensure adequate coping skills with various situations which may arise. To discuss changes in self-management which may be necessary in unfamiliar circumstances.

Objectives:

That the patient will be able to:

1. Explain the importance of declaring diabetes for driving, insurance and employment purposes.
2. Describe appropriate adjustments in insulin and/or diet in the event of travel, holidays, shift work, social occasions.
3. Explain the need for NHS exemption certificates and the procedure for renewal.
4. Aware of the E111 medical insurance form for travelling abroad.
5. Demonstrate an understanding of contraception and pregnancy in diabetes (where appropriate)

6. Aware of the types of insulin carrying cases available and how to obtain these.
7. Explain the significance of dental care in diabetes.
8. Demonstrate confidence to alter insulin/diet regime to accommodate various activities, e.g. meals, sport.

STRUCTURE OF PRESENTATION

Transition:

The HbA₁ test results from the previous session were given to each patient individually and discussed.

Content:

The topic - practical problems - was introduced and the order of presentation described.

Insurance was considered with respect to the higher premium usually required for life and car insurance. Patients were advised on the type of increases expected and the BDA were recommended for advice/guidance on reasonable quotes. The importance of declaring diabetes for insurance purposes was emphasised.

Travel and holidays were discussed with respect to time changes, insulin adjustments, dietary changes, insulin storage, travel sickness, medical insurance, E111 forms and types of insulin carrying cases were illustrated. Patients were encouraged to enjoy travel and holidays and to cope with adjustments in diet and insulin which are often necessary.

Various social occasions requiring alterations in meal times were discussed, e.g. weddings, dinners, parties, buffets, etc. Ways to accommodate these, with respect to insulin and diet, were discussed, and recommendations given for different insulin regimes.

Employment was discussed and unsuitable jobs for an insulin-dependent diabetic were listed. Patients were urged to declare diabetes at work for safety purposes. Shift work and the necessary alterations in insulin times was discussed.

Contraception and pregnancy were considered where appropriate, and pre-conception control was emphasised.

Various other practical aspects of diabetes were also considered such as dental treatment and care, other medications, NHS prescription exemption certificates, donating blood, etc.

Summary:

The session was summarised by a list of comments advising patients on practical management:

1. Declare diabetes for insurance.
2. Do travel and enjoy holidays - but work it out properly - ask on the Diabetic Unit if you are not sure.
3. Don't miss out on social events - do go along and do eat the meal, but work it out into your diet and insulin timetable.
4. Diabetes is not an illness - it is a condition - you can work in almost anything. There are very few jobs you cannot do.

5. Do tell people at work about your diabetes.
6. Shift work can be done, but it does need to be worked out properly.
7. Contraception is the same for diabetics as that of non-diabetics - ask your doctor.
8. Pregnancy - do not be put off having children - there is only a 1% greater chance of your children having diabetes.
9. Pre-conception control is vital - and good control in pregnancy is a must.
10. There is very little a diabetic person cannot do - but it does take a little bit more thought to get it right - do that!

Discussion:

This was encouraged throughout the session by asking the group members on how they would cope with certain hypothetical situations, e.g.

1. You are going to a wedding and the main meal will be served at 3.30 p.m. - what would you do?
2. You are travelling to New York and there will be a time change of 5 hours. When you arrive it is 7 p.m. English time but only 2 p.m. American time - what would you do about your next injection?
3. You have been invited out for a meal with your work and the meal is to be served at 8.30 p.m. - what would you do about your insulin?
4. If you were travelling on a plane, where would you keep your insulin.

Motivational Aspects:

Patients were encouraged to participate and enjoy social events, and given the knowledge and confidence to cope with various situations. Results of the previous HbA_{1c} test were given and which provided a source of feedback.

Evaluation:

Group discussion was most valuable in this session to introduce 'persuasion' elements for patients to become more flexible about insulin/diet regimes, whilst still ensuring optimal diabetic control. There were several coping situations in which patients disagreed, e.g. time changes, meals out, weddings, shift work etc. These were subsequently considered taking into account the different insulin regimes. Generally, there were several practical situations which patients were very unsure about and this proved to be a most valuable session, helping patients to apply their knowledge of diabetes in management aspects.

PRACTICAL SITUATIONS AND DIABETES: - Script

1. Diabetes will affect you when taking out insurance, whether this is car or life insurance, and there will be usually extra premiums to pay. If the amount seems unreasonable, contact the BDA (01-323 1531) or write to 10 Queen Anne Street, London W1M 0BD, to enquire about a recommended company in your area.

Normally the insurance company will ask for a medical report from a doctor at the clinic or from your own G.P.

2. Travelling

Always go wherever you want! If you are going abroad, time changes may be involved. Change the time of insulin by 2 hours/time, e.g. New York, 5 hours slow, therefore when arrive go back 5 hours etc.

e.g. Day 1 - Insulin 8 a.m., plane 10 a.m, arrive at 7 p.m. English time or 2 p.m. American time

Evening insulin at 3-4 p.m.

If high sugar later on, then soluble insulin - 4 units.

Day 2 - Insulin 7 a.m. (1 hour earlier) and evening insulin at 5-6 p.m.

Day 3 Normal regime.

Change the insulin times gradually.

3. When travelling on a plane, the temperature in the luggage compartment can fall to freezing, therefore your insulin should be kept with your hand luggage. On trains and boats keep some insulin in different luggage containers. No need for thermos flasks unless you are in the tropics for a couple of weeks.

If your insulin is smashed and you don't have any spare, then go to the nearest hospital - they will supply most of the common types of insulin. Everyone is on U100 now.

When travelling always carry extra portions because delays are very common.

4. Medical Insurance

When travelling, holiday insurance is important. Also when visiting EEC countries in Europe there is a special form called an

E111 form which you can obtain from the DHSS office. This form covers your medication costs in the EEC countries.

5. Travel sickness pills

These don't interfere with blood glucose levels and therefore are usually fine - it is better to take these than to be sick.

6. Carrying cases for insulin

Show these, e.g. Hypoguard and Medistron types.

7. Eating out

You could do several things but always remember - never leave too long a gap between the long acting insulins, you must be covered for 24 hours.

The evening meal is the one you usually have to consider when you are eating out and often is later than the usual time. You could:

- (a) Have the bedtime snack at tea time and the meal later in the evening - therefore injection time as normal.
- (b) Have your injection 1-2 hours later, e.g. on holiday.
- (c) If on 2 insulins, the long acting one at usual time and have the fast-acting one half-an-hour before the meal.
- (d) If on long acting only - you could have an injection slightly later.

Discuss these options.

8. Foods when eating out

Usually more greasy but may also have more carbohydrates - you still must count the carbohydrates! Perhaps you could take 2 extra

units of short acting insulin if necessary when the meal contains a lot of carbohydrate, e.g. pizza.

9. All prescription charges are free, but you must fill in an exemption form every 5 years. You can get these from the receptionist at your G.P.s. Plastic insulin syringes and BM blood testing sticks are not available on prescription.

10. Giving blood

No - not because your blood is any different, but the cause of diabetes is not fully known and could be related to a virus infection, therefore it would be too much of a risk.

11. Employment

Some jobs are out completely - these are jobs where a hypo could result in danger for you or other people. You must inform employers that you are diabetic, and make sure the people you work with know what a hypo is and what to do.

Jobs which you cannot take: Armed Services

Police

Flying aeroplanes

Bus driver

Train driver

Steeplejack!!!

Some people have found employers are prejudiced about diabetes and felt they did not get a particular job because of their diabetes. If you do experience this, please inform the doctor in clinic.

12. Shift work

If this is lates and earlys then you can take your insulin earlier or later than usual - making sure you keep the same time interval between the two injections and that you don't skip meals. If you are doing complete reversal of days and nights, then you must swop the morning insulin for the evening one and treat the night as your daytime.

13. Driving

You must declare diabetes on your driving licence application form. There is a special section under 'Health' in which diabetes is listed (illustrate). Your GP or hospital doctor is usually contacted before you are given a licence. The licence is only valid for 3 years; you have to renew this again. If you already have a licence you should inform the Licence Office in Swansea.

14. Dentist

Diabetics with poor control are susceptible to disease of the gums and therefore it is most important to look after your teeth. The treatment at the dentist is no different because you are diabetic and you should continue with your diet and insulin the same. However, a general anaesthetic usually requires admission into hospital.

15. Pregnancy

There is no reason why diabetic women shouldn't have children, since the chances of your child becoming diabetic is only increased by 1% compared to other children. It is important that best possible

control is achieved before and during pregnancy for the proper development of your child. It can also make the birth a lot easier.

16. Contraception

This is the same for diabetics as it is for non-diabetics. There is usually no reason why diabetic women cannot take the pill. However, after the first child is born other methods are often preferred by the doctor. It is an important part of diabetes treatment to plan your family because the best possible pre-conception control is necessary.

17. Other medications - tablets/medicines

Cough mixtures and medicines are often sweet and contain glucose and these would increase your blood glucose concentration. It is a good idea to check with the pharmacist before taking the medicine or tablets - other sugar-free cough mixtures are now available.