A close-up photograph of a nurse's gloved hand holding a large medical syringe filled with a yellowish liquid. The background is a blurred clinical setting with medical equipment.

DIABETES AND ENTERAL FEEDING

➤ WHY IS THIS LEAFLET FOR YOU?

This leaflet is for people with diabetes established on an enteral feeding regimen, and for the people who support them at home, in residential care or in hospital. It explains why enteral feeding is needed, how the feed may affect blood glucose levels in people with diabetes, and how to manage enteral feeding combined with insulin treatment to maintain safe blood glucose control. This leaflet contains important information on:

- Enteral feeding
- Types of diabetes
- Insulin therapy
- Managing blood glucose levels
- Monitoring blood glucose levels

> WHAT IS ENTERAL FEEDING

Enteral feeding is a method of getting fluids and liquid food into the digestive tract of people who are unable to eat and swallow safely. The fluid feed is introduced through a tube which may be inserted through the nose (naso-gastric tube) or into the stomach (gastrostomy) or into the small intestine (jejunostomy). The feed contains vital vitamins and nutrients including carbohydrates (sugars and starches). Carbohydrates are needed by the body for energy. They cause the glucose levels in the blood to rise. In people with diabetes, the blood glucose levels may rise too high and treatment is needed to control this.

Aims of the feed and diabetes treatment::

- To provide adequate nutrition
- To keep safe (avoid very low blood glucose levels)
- To manage symptoms of high blood glucose

> TYPES OF DIABETES

Glucose is the main source of energy needed for the body to perform all the processes required for life. Insulin is produced by the body to do this and to keep the glucose at the right level in the blood. An absence or reduced amount of insulin means the body cannot use glucose for energy effectively. The amount of insulin produced depends on the type of diabetes:

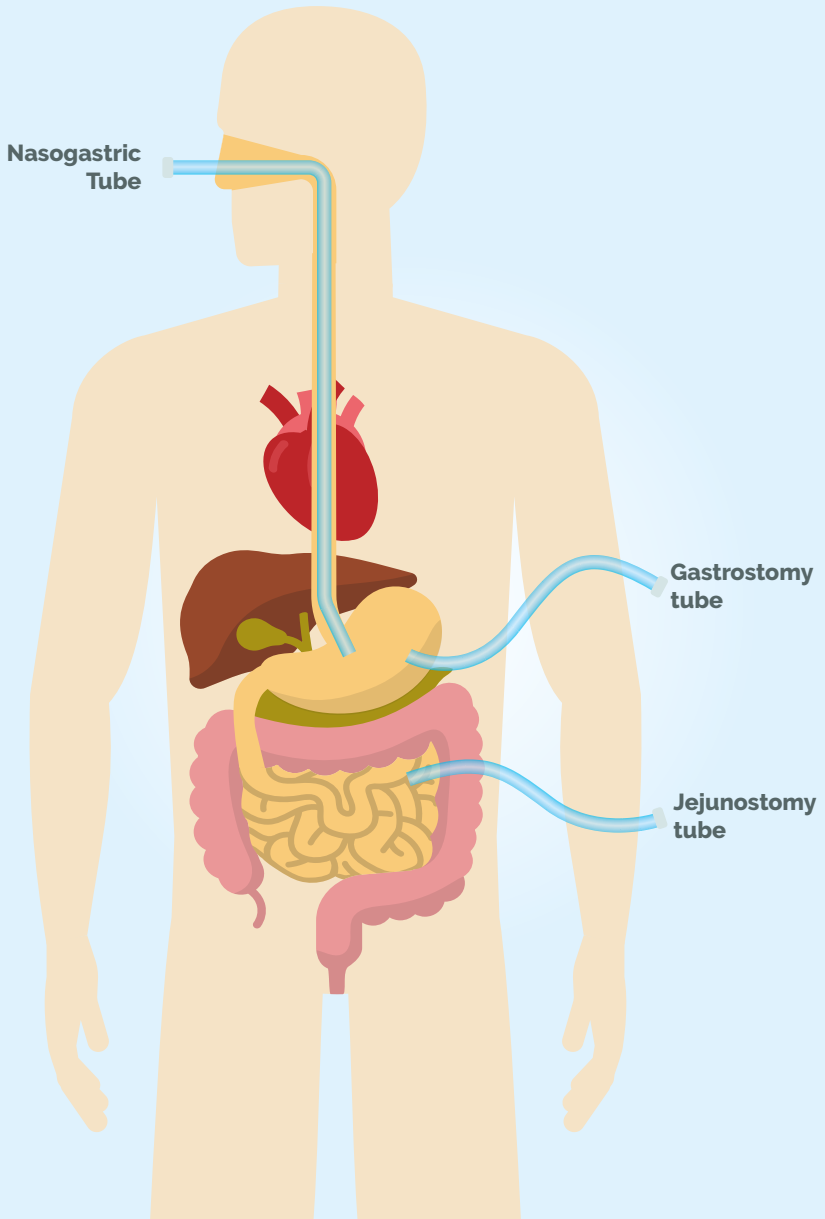
People with type 1 diabetes produce no insulin and therefore are dependent on insulin injections. Insulin injections must never be stopped completely in someone with type 1 diabetes



People with type 2 diabetes either do not produce enough insulin or the insulin does not work effectively. It can be treated by a healthy diet alone, or with tablets and/or insulin



➤ ROUTES OF FEEDING



> FINDING THE RIGHT INSULIN FOR THE FEEDING REGIMEN

The content of the feed should be agreed following an assessment by a dietitian. It will include adequate vitamins, minerals, fats, proteins, carbohydrates and fluids, as well as the right number of calories to maintain an ideal weight.

However, in people with diabetes, the carbohydrate content of the feed may make the blood glucose rise too high. The kidneys respond to this by taking glucose from the blood and moving it into the urine, where it is excreted by the body. The loss of glucose in the urine means a loss of calories and therefore energy source.

Most diabetes tablets are not available in liquid form (the exception is metformin). Tablets should not be crushed and inserted into the feeding tube as this may block the tube and also the medication may not work correctly. Therefore, if other diabetes medication is required to control blood glucose, insulin therapy is needed.

There are a number of different types of insulin which vary in how quickly and how long they last for. The type of insulin used will depend on the content, duration and frequency of the feeds. The insulin needs to work during the time that the feed is active (and when the glucose levels in the blood are rising). If there is a mis-match, the blood glucose may drop too low or rise too high. The table below gives some common feed and insulin regimens:

Prolonged feed (e.g. overnight): Intermediate insulin is given at the start of the feed, or a mixture of intermediate and short-acting insulin is given at the start and half-way through the feed

Bolus feeds: a short-acting insulin at the beginning of every feed (a long-acting insulin is also needed in people with type 1 diabetes)

Continuous feed with regular or ad hoc meals: an intermediate or long-acting insulin is given at the beginning of the feed, and a short-acting insulin is given with each meal or supplementary feed consumed

➤ HIGH BLOOD GLUCOSE LEVELS (HYPERGLYCAEMIA)

The blood glucose level will rise too high if the body is unable to produce enough insulin to control it, or the carbohydrate content of the feed is higher than the amount of insulin produced (or injected) can cope with. Starting insulin therapy, increasing the dose, or changing the type of insulin to match the feed content is the usual way of managing high blood glucose levels.

However, other factors can cause high blood glucose levels and need to be identified before a change in the regimen is made:

- Infection
- Pain and stress
- Steroid treatment
- Weight gain –this makes the body less sensitive to the action of insulin
- Changing the feed to one with more carbohydrate without an increase in insulin dose
- Incorrect omission of insulin
- Poor injection sites and lipohypertrophy
- Equipment failure or mis-use

Signs and symptoms of high blood glucose:

- Blood glucose tests are above the agreed target
- Increased urine production
- Thirst and dry mouth
- Dehydration
- Sleepiness
- Genital itching and thrush

Oral hygiene is essential for people having enteral feeding. This is particularly important if blood glucose levels are high

➤ LOW BLOOD GLUCOSE LEVELS (HYPOGLYCAEMIA)

In someone without diabetes, the right amount of insulin is produced by the body to keep the blood glucose levels steady, and never too low or too high. In someone with diabetes using insulin, the blood glucose may drop too low if there is a mismatch between the insulin dose or type, and the carbohydrate content of the feed.

Other factors can increase the risk of hypoglycaemia with insulin therapy:

- Increased activity (e.g. physiotherapy, restlessness due to pain)
- Feeding tube is blocked or positioned incorrectly
- The carbohydrate content of the feed is reduced but the insulin dose or type is not adjusted
- Insulin is injected into muscle instead of fat. This results in the insulin working too quickly
- Stopping the feed
- Vomiting
- Mal-absorption
- Insulin is not given at the correct time

Signs and symptoms of low blood glucose (less than 4 mmol/L):

- Shaking
- Sweating
- Pallor
- Confusion
- Drowsiness
- Coma

How to treat hypoglycaemia:

- ❗ If unconscious, lie the person on their side and maintain airway. Give glucagon injection if available and trained to do so. Contact emergency services
- ❗ If conscious and feeding tube in place:
 - Stop the feed
 - Give 15 to 20g quick-acting carbohydrate (e.g. 60ml Gluco juice, 50 to 70ml Fortijuce or Ensure Plus juice or 3 to 4 teaspoons of sugar dissolved in warm water)
 - **Or** 2 tubes of Glucogel (not for fine-bore tubes as may cause a blockage)
 - Flush tube with 30ml water
 - Wait 10 to 15 minutes and re-check blood glucose level
 - If still less than 4 mmol/L, repeat treatment
 - Once blood glucose level is above 4 mmol/L, resume feed
 - If hypoglycaemia occurs between feeds, treat as above and once blood glucose is above 4 mmol/L, connect the feed and give enough to deliver 20g of carbohydrate (see the feed label)
 - Consider what caused the low blood glucose and take action to avoid a recurrence. Contact the diabetes specialist nurse if no obvious cause

➤ HOW OFTEN TO TEST BLOOD GLUCOSE LEVELS

Blood glucose monitoring frequency will depend on:

- Type of diabetes
- Treatment (particularly treatments that carry a risk of hypoglycaemia)
- Frequency of feeds
- Stability of blood glucose and general condition

An appropriate blood glucose target should be agreed. For most people, this is 6 to 12 mmol/L. This gives a safety margin above hypoglycaemia but does not tolerate persistently high levels that can cause symptoms

Ketones should be tested in people with type 1 diabetes if the blood glucose level rises to 15 mmol/L or higher on 2 or more occasions, or the person is unwell or showing signs of infection. Ketones develop when the body is so severely deficient in insulin that glucose cannot be converted into energy. High levels of ketones can lead to the development of an emergency condition called diabetic ketoacidosis. Ketones can be tested using a blood or urine testing kit. If the blood ketone level is 1.5 mmol/L or higher, or the urine ketones are ++ or higher, urgent medical attention is needed

Eating and its many benefits:

Eating and food does not just provide nutrition. For example, it plays an important part in social interaction, and gives feelings of pleasure and enjoyment. People who are unable to eat normally and using enteral feeding miss out on these benefits.

Also, food plays an important role in the self-management of diabetes, and so enteral feeding may be associated with a feeling of loss of control, loss of choice and loss of enjoyment of eating. If communication problems are present as well, it is not surprising if low mood and depression sets in. Discussion with the GP and referral to counselling services in the community may be helpful.



> KEY MESSAGES

- ❗ Keep safe:
 - Regular blood glucose monitoring
 - Know how to identify and treat hypoglycaemia
- ❗ Avoid prolonged episodes of high blood glucose levels: this will result in a loss of the calories and nutrients required
- ❗ People receiving enteral feeding miss out on the many benefits of food and the pleasure of eating. Food is an important part of diabetes management and the loss of control over this part of their diabetes can be stressful



> USEFUL RESOURCES:

TREND-UK: www.trend-uk.org

Diabetes UK: www.diabetes.org.uk

JBDS Glycaemic management during the in-patient enteral feeding of stroke patients with diabetes (available on www.diabetes.org.uk)



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