

# Recognition, treatment and prevention of hypoglycaemia in the community

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Supporting, Improving, Caring

## Rationale and remit

This guidance has been developed to advise on the recognition, treatment and prevention of hypoglycaemia in the community in adults with diabetes mellitus. It is intended to serve as a helpful resource for a range of groups, including those caring for people with diabetes in the community, commissioners, designers of services and healthcare professionals.

The guidance was commissioned by NHS Diabetes and the recommendations have been developed by Training, Research and Education for Nurses in Diabetes (TREND-UK). Other diabetes organisations have been involved in the development of the guidance via a process of review.

It is hoped that the guidance will be useful to clinicians and service commissioners in planning, organising and delivering high-quality diabetes care. Healthcare professionals do, however, have an individual responsibility of care to make decisions appropriate to the circumstance of the individual person with diabetes, informed by the person with diabetes and/or their guardian or carer, and taking full account of their medical condition and treatment.

When implementing this guidance, full account should be taken of the local context and any action taken should be in line with statutory obligations required of the organisation and individual. No part of the guidance should be interpreted in a way that would knowingly put anybody at risk.

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## Introduction

### What is diabetes?

Diabetes is a condition in which the amount of glucose in the blood is too high due to defects in insulin secretion, action or both (American Diabetes Association, 2009). *Table 1* outlines the two most common types of diabetes.

## Recognition

### What is hypoglycaemia?

Hypoglycaemia is the medical term for low blood glucose, and is defined as a blood glucose level of less than 3.5 mmol/L.

Hypoglycaemia may occur when people with diabetes are treated with some drugs such as sulphonylureas, prandial regulators or insulin (Diabetes UK, 2011).

### What are the signs and symptoms of hypoglycaemia?

Examples of the early signs and symptoms of hypoglycaemia include:

- Sweating.
- Palpitations.
- Shaking.
- Hunger.

The late signs of hypoglycaemia include:

- Confusion.
- Drowsiness.
- Odd behaviour.
- Speech difficulty.
- Lack of co-ordination.
- Coma.

### What causes hypoglycaemia?

*Table 2* summarises the main factors that may cause or precipitate hypoglycaemia in people with diabetes who are using sulphonylureas, prandial regulators or insulin.

### Who is at particular risk of hypoglycaemia or its consequences?

Some people with diabetes are at particular risk of hypoglycaemia. For example:

- People who frequently experience hypoglycaemia, even if they are able to treat themselves.
- People with poor hypoglycaemia symptom awareness.
- People who fast (e.g. during Ramadan).
- Those with variable eating or exercise patterns.
- Older people, such as those in the early stages of dementia.
- Those with poor mental health.
- People with a learning disability.
- Those with alcohol-related health problems.
- People with poor injection technique.
- People using antidiabetes drug therapies incorrectly (e.g. dose or timing).
- Women who are pregnant or breastfeeding.

There are also groups for whom hypoglycaemia has potentially severe consequences. For example those who drive, work at heights, or live alone.

### How common is hypoglycaemia?

People with diabetes tend to under-report hypoglycaemia because they or their carers do not recognise what is happening. They may also be reluctant to talk about hypoglycaemia due to the risk of increased restrictions to their way of life, such as loss of their driving licence or job. However, this means that the actual number of people with diabetes who experience hypoglycaemia is unknown (Bailey et al, 2010).

Studies estimate that up to 30% of people with type 1 diabetes experience severe hypoglycaemia (i.e. an episode of hypoglycaemia in which the person affected requires the assistance of someone to treat them) each year (Bailey et al,

Table 1. The two main types of diabetes.

Type 1 diabetes	Type 2 diabetes
<ul style="list-style-type: none"><li>● Develops when the insulin-producing cells in the pancreas have been destroyed and the body cannot produce any insulin.</li><li>● Affects 5 to 15% of people with diabetes.</li><li>● Treated with insulin injections, a healthy eating plan and regular physical activity.</li></ul>	<ul style="list-style-type: none"><li>● Develops when the pancreas can still make some insulin, but not enough, or when the body is resistant to the effects of insulin.</li><li>● Affects 85 to 95% of people with diabetes.</li><li>● Treated by normalising weight where appropriate, eating healthily, taking regular physical activity and tablets. Injectable medications may also be required.</li></ul>

Table 2. The causes of hypoglycaemia in people with diabetes.

### Medication

Some glucose-lowering agents taken by people with diabetes are associated with hypoglycaemia:

- Sulphonylureas (in particular, long-acting sulphonylureas such as glibenclamide may be associated with a higher risk of hypoglycaemia than short-acting sulphonylureas).
- Insulin.
- Prandial regulators (e.g. nateglinide, repaglinide).

In conjunction with the glucose-lowering agents listed above, others may precipitate or mask the effects of hypoglycaemia (e.g. warfarin, beta-blockers and angiotensin-converting enzyme [ACE] inhibitors). A pharmacist can provide further advice.

Metformin, pioglitazone, dipeptidyl peptidase-4 (DPP-4) inhibitors and glucagon-like peptide-1 (GLP-1) receptor agonists do not cause hypoglycaemia when used alone, but hypoglycaemia may occur when used with the drugs listed above.

### Lifestyle

Certain lifestyle factors may lead to hypoglycaemia in people taking the glucose-lowering agents listed above:

- Diet – e.g. delayed or missed meals, eating less starchy food than usual, drinking too much alcohol, or drinking alcohol without food.
- More physical activity than usual.

### Complications of diabetes

Some complications of diabetes are associated with an increased risk of hypoglycaemia.

- Renal impairment can cause severe hypoglycaemia due to prolonged action or build up of insulin or sulphonylureas.
- Autonomic neuropathy can cause delayed stomach emptying, or loss of hypoglycaemia awareness symptoms.

2010). In people with type 2 diabetes treated with sulphonylureas, or on insulin for less than 2 years, the annual rate of severe hypoglycaemia was 7% (UK Hypoglycaemia Study Group, 2007). Although hypoglycaemia is less common in people with type 2 diabetes than type 1 diabetes (UK Hypoglycaemia Study Group, 2007), the actual number of cases of hypoglycaemia may be higher in type 2 diabetes due to the larger numbers of people with this condition.

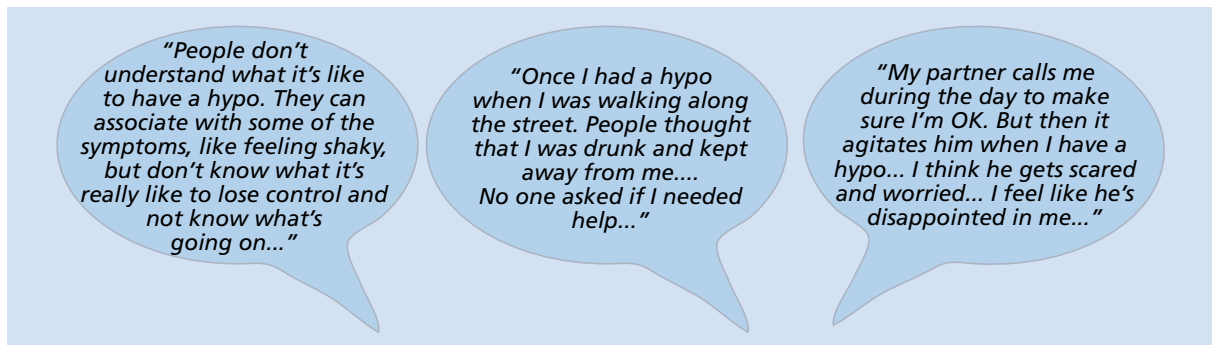
### The impact of hypoglycaemia

Hypoglycaemia impacts upon a number of areas of a person's life. For example:

- Quality of life: in the Diabetes UK hypoglycaemia survey, over half (52%) of those surveyed believed mild to moderate hypoglycaemia affected their quality of life (Diabetes UK, 2010). *Figure 1* describes what it is like to experience hypoglycaemia.

- Time off work: one in ten people surveyed had to take at least 1 day off work in the last year as a result of mild to moderate hypoglycaemia (Diabetes UK, 2010).
- In the older person: hypoglycaemia has greater consequences for the older person with diabetes, as they are more prone to falls (Schwartz et al, 2002) and fractures (Nicodemus et al, 2001). There is a higher risk of mortality following hospital admission, and some may also experience permanent neurological damage (Sinclair, 2006).
- Driving and road accidents: in the UK, hypoglycaemia is implicated in approximately 30 serious road traffic accidents each month and up to five fatalities each year (Choudhary et al, 2011).
- Weight gain: people who experience multiple episodes of hypoglycaemia may eat additional food to raise their blood glucose levels, leading

Figure 1. How people describe their experiences of hypoglycaemia.



to weight gain (Ross, 2004).

- Medication adherence: hypoglycaemia may mean that people with diabetes are reluctant to take their medication because of fear of hypoglycaemia, and they may not achieve target blood glucose levels (Alvarez Guisasola et al, 2008).

#### *The financial cost of hypoglycaemia*

The costs of severe hypoglycaemia are considerable. It is estimated that each hospital admission for severe hypoglycaemia costs the NHS around £1000 (Amiel et al, 2008). Even if hospital admission is not required, significant costs may still be incurred from paramedic service involvement.

## Treatment

### *Mild hypoglycaemia*

Hypoglycaemia is commonly defined as "mild" if the person affected is able to treat themselves (Diabetes Control and Complications Trial Research Group, 1993). Suitable treatments for raising blood glucose quickly (15 to 20 g glucose) in cases of mild hypoglycaemia include:

- 100 mL of Lucozade™.
- 150 mL (a small can) of **non-diet** fizzy drink.
- 200 mL (a small carton) of smooth orange juice.
- Five or six dextrose tablets.
- Four large jelly babies.
- Seven large jelly beans.
- Two tubes of glucose gel.

If the person does not feel better (or their blood glucose level is still less than 4 mmol/L) after 5 to 10 minutes, repeat one of these treatments. When the person starts to feel better, and if they are not due to eat a meal, they should eat some starchy food, such as a sandwich or a banana and be monitored afterwards.

### *Severe hypoglycaemia*

In cases of severe hypoglycaemia the person affected will need the assistance of someone else to treat them (Diabetes Control and Complications Trial Research Group, 1993) as they may not realise they are hypoglycaemic or may be unable to treat themselves.

If the person is conscious and able to swallow safely, offer one of the suitable treatments listed earlier. Repeat the treatment as required and stay with them until they have recovered.

If the person is unconscious, they should be put in the recovery position (on their side with their head tilted back). Glucose treatment should **not** be put in their mouth. Glucagon can be injected if someone is present who is trained to do so. Otherwise, dial 999 for an ambulance.

The NICE Quality Standards for diabetes in adults (NICE, 2011) recommend that people with diabetes receive an ongoing review of treatment to minimise hypoglycaemia. If they have experienced a hypoglycaemic episode requiring medical attention they should be referred to a specialist diabetes team.

**A simple algorithm at the end of this document summarises the advice given for treating mild and severe hypoglycaemia.**

### *Treating hypoglycaemia in special situations*

#### *In enterally (tube) fed patients*

Enterally (tube) fed patients who are also able to take liquids or solids orally should be treated with the recommended hypoglycaemia treatments. Recommended liquid hypoglycaemia treatments (such as 100 mL of Lucozade™) can be given via the feeding tube, with a break in the feed if necessary.

In patients receiving bolus feeding, if a bolus has recently been given, the hypoglycaemia treatment may be less effective due to slower

absorption of glucose. Intramuscular glucagon may be necessary. To prevent recurrence of hypoglycaemia, an additional feed may be needed. Diabetes treatment must be reviewed to prevent further episodes of hypoglycaemia.

#### *In people with diabetes who use insulin pumps*

In cases of mild hypoglycaemia, the insulin pump should be kept running, and guidance for the management of mild hypoglycaemia should be followed as per the section entitled "Treatment" on page 5. Once the blood glucose level is 4 mmol/L or more, the person should consume some starchy food, or if a meal is due, the mealtime insulin bolus should be reduced by 0.5–1 units instead.

In cases of severe hypoglycaemia, the insulin pump should be either stopped or the insulin supply interrupted, and guidance for the management of severe hypoglycaemia should be followed as per the section entitled "Treatment" on page 5. The pump should be restarted as soon as the person has recovered from hypoglycaemia, in order to prevent very high blood glucose levels later.

Encourage the individual to contact the specialist team.

#### *In people with diabetes who fast*

If people with diabetes wish to fast (for example during Ramadan), they should visit their diabetes nurse or doctor beforehand for advice about changing dose, timing and/or type of treatment. They should understand that they must always break their fast if hypoglycaemia occurs.

Guidance for the management of mild and severe hypoglycaemia should be followed as per the section entitled "Treatment" on page 5.

#### *In people with diabetes who are uncooperative*

Some people who experience hypoglycaemia may become uncooperative. Glucagon can be injected if someone present is trained to do so. Otherwise, dial 999 for an ambulance.

## Prevention

### *How can hypoglycaemia be prevented?*

This section is divided into two parts. The first part provides general advice on the prevention of hypoglycaemia. The second part provides specific advice for the healthcare provider.

### *General advice*

- Be aware of situations that increase the risk of hypoglycaemia (e.g. increased physical activity, excessive alcohol).
- Encourage people with diabetes to eat regularly if taking sulphonylureas or insulin. Include a portion of starchy carbohydrate at each meal (i.e. bread, rice, potatoes, pasta or cereals).
- Ensure that people with diabetes know the early symptoms of hypoglycaemia and how to treat it promptly. These may vary between individuals.
- Encourage people with diabetes and their carers to check that they have received the correct insulin from their pharmacist.
- Make sure that people with diabetes have treatment for hypoglycaemia readily available (e.g. at home, in their car, in their pocket or handbag).
- Advise people with diabetes who are susceptible to hypoglycaemia to carry some identification to alert others (e.g. an identity bracelet or identity card).

### *Specific advice for the healthcare professional*

- Prescribers and pharmacists should discuss and reinforce information on hypoglycaemia, particularly when a sulphonylurea or insulin has been prescribed for the first time and at annual review.
- Pharmacists should ensure that the correct insulin is dispensed.
- Hypoglycaemia is a hazard to safe driving. People with diabetes must inform the Driver and Vehicle Licensing Agency (DVLA) if they (DVLA, 2011):
  - Are taking insulin.
  - Experience more than one episode of disabling hypoglycaemia within 12 months.
  - Develop impaired awareness of hypoglycaemia.
  - Suffer disabling hypoglycaemia whilst driving.People with insulin-treated diabetes should:
  - Carry their blood glucose meter and blood glucose strips with them, and check their blood glucose before driving. On long journeys they should test it regularly (every 2 hours).
  - Take a snack before driving if their blood glucose is 5.0 mmol/L or less. They should not drive if they feel hypoglycaemic, or if their blood glucose is less than 4.0 mmol/L.

Table 3. Questions that can be asked to explore hypoglycaemia with a person with diabetes, grouped in categories (adapted from Barnett et al, 2010).

*People with diabetes may not understand the term hypoglycaemia or the concept of low blood glucose*

- What do you understand by the term “low blood glucose”?
- What do you call it when you have low blood glucose?
- What do you understand by the term “hypo” or “hypoglycaemia”?

*People with diabetes may not understand that hypoglycaemia is caused by their glucose-lowering medication rather than their diabetes*

- What do you think causes hypoglycaemia?

*People with diabetes may not realise they have experienced hypoglycaemia or know what to look for*

- How would you recognise a “hypo”?
- Have you ever felt shaky and sweaty, maybe when you haven’t eaten for a long time?

*People with diabetes may not appreciate the implications of hypoglycaemia*

- What do you think the effects of hypoglycaemia are?
- Do you drive, cycle regularly or operate machinery?

*People with diabetes may not understand what to do if they experience hypoglycaemia*

- Have you ever had a hypo and how did you feel?
- How many times have you had a hypo in the last month?
- How would you treat a hypo?

*People with diabetes may not carry glucose with them in case of hypoglycaemia*

- If you had a “hypo” now, how would you treat it?
- Are you carrying glucose with you now?

- Stop driving their vehicle as soon as possible in a safe location if hypoglycaemia develops while driving. The person should treat the hypoglycaemia and not resume driving until 45 minutes after blood glucose has returned to normal.
- Keep an emergency supply of fast-acting carbohydrate such as glucose tablets or sweets within easy reach in the vehicle.
- Take regular meals, snacks and rest periods on long journeys, and always avoid alcohol. Please refer to the DVLA website for further information ([www.dft.gov.uk/dvla/drivers.aspx](http://www.dft.gov.uk/dvla/drivers.aspx)).
- Ensure that those at risk of hypoglycaemia, particularly those with poor hypoglycaemia awareness have access to glucose self-monitoring and understand how to use it.

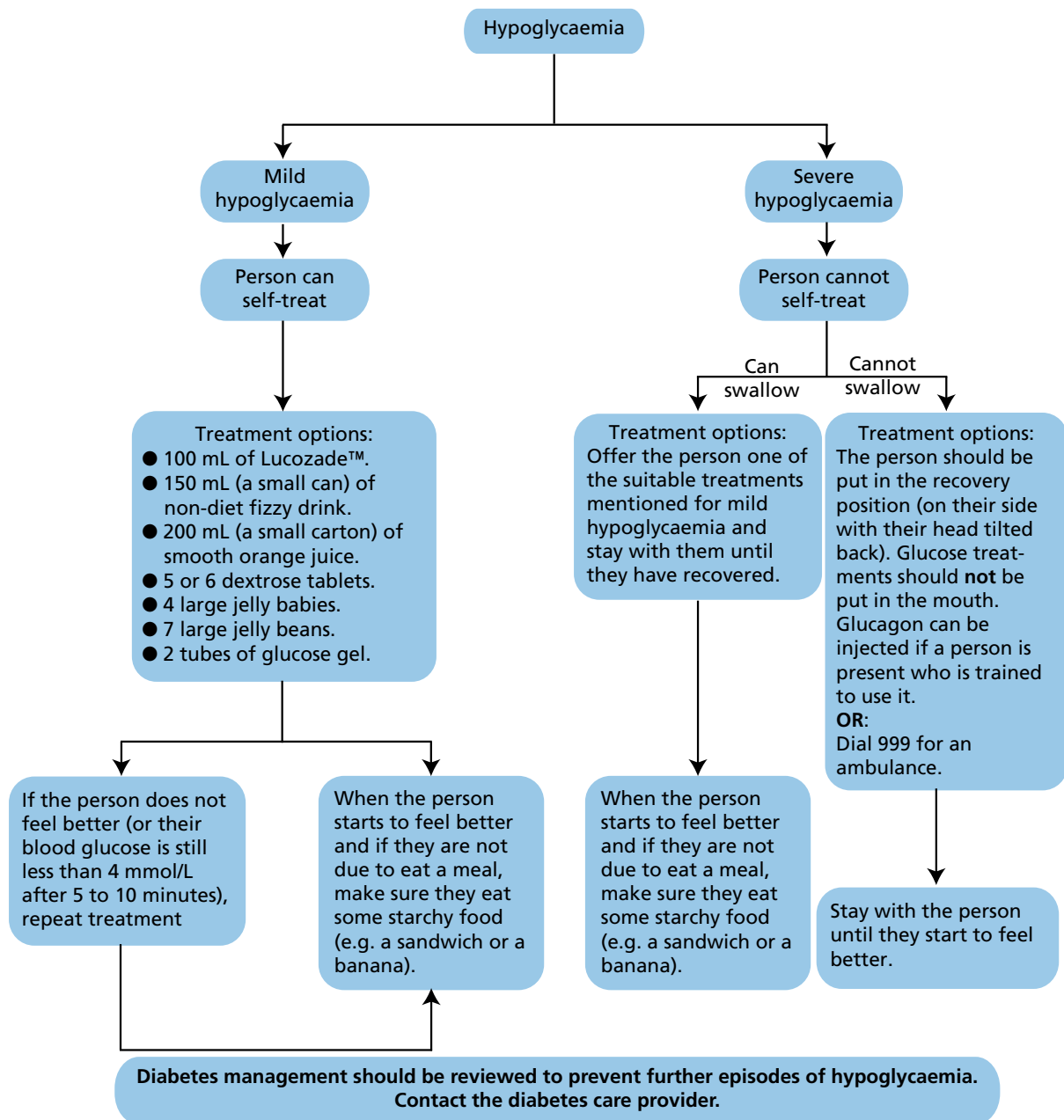
### Questions to ask to identify hypoglycaemia

Table 3 gives examples of questions a healthcare professional or those who care for people with diabetes in the community can ask to identify hypoglycaemia.

## Conclusions

Hypoglycaemia is a side effect of particular diabetes treatments that can have a wide-reaching impact on a person’s life. It is important to educate people with diabetes, their carers and other professionals in the early recognition, treatment and prevention of the condition in the community. Simple steps can be taken to prevent harm from hypoglycaemia through prompt and effective management of the condition.

## Appendix: Hypoglycaemia management algorithm



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