Diabetic with suspected hypoglycaemia

Attempt to measure blood glucose prior to treatment

Emergency treatment

Is patient co-operative and able to swallow?

No

Give intravenous glucose or parenteral glucagon

Inadequate response

Establish 10% dextrose infusion

Consider empirical steroids

Consider urgent referral to A&E

Patient education and counselling

Search for cause of severe hypoglycaemia

Make appropriate adjustments

Yes

Oral glucose treatment

Inadequate response

Satisfactory response

Repeat oral glucose treatment up to 3 times

Feed meal with complex carbohydrates

Deterioration or inadequate response

Patient education and counselling

Hypoglycaemia awareness

Refer to endocrinology

Attempt to reverse state of unawareness

Search for cause of hypoglycaemia

Make appropriate adjustments

Consider referral to endocrinology
1 Diabetic with suspected hypoglycaemia

Quick info:
- combination of sympathomimetic and neurological clinical features
- hypoglycaemia is defined as a blood glucose less than 3mmol/L; however, hypoglycaemic symptoms can occur at a higher blood glucose level in those with diabetes
- symptoms of sympathetic drive:
  - sweating
  - anxiety
  - tremulousness
  - nausea
  - tachycardia
  - pallor
- symptoms of neuroglycopaenia:
  - fatigue and drowsiness
  - aggression
  - dizziness
  - visual disturbances
  - speech impairment
  - poor concentration
  - abnormal behaviour
  - confusion
  - loss of consciousness and seizures
- symptoms vary between patients but individuals tend to show the same manifestations with each episode
- patients may be unaware of hypoglycaemic symptoms
- symptoms may suggest hypoglycaemia but diagnosis depends on demonstration of hypoglycaemia and resolution by administration of glucose

2 Attempt to measure blood glucose prior to treatment

Quick info:
- rapid finger-prick bedside testing to check blood glucose level
- if the patient is not a diabetic on treatment, consider drawing extra blood (do not allow this to delay treatment) for:
  - insulin
  - C-peptide
  - cortisol
  - growth hormone
- never withhold therapy pending confirmation of bedside or laboratory testing

3 Emergency treatment

Quick info:
- medical emergency
- patients with poorly-controlled diabetes experience hypoglycaemic symptoms at a higher sugar level than in those with well-controlled diabetes
- autonomic neuropathy in longstanding diabetes may impair adrenergic and glucagonergic response

7 Give intravenous glucose or parenteral glucagon

Quick info:
- intravenous (IV) glucose:
  - 25mL glucose 50%; or
  - 50mL glucose 20%; or
  - 100mL glucose 10%; or
- glucagon 1mg (IV, intramuscular or subcutaneous)
- IV glucose is irritant, especially if more concentrated solutions are used or extravasation occurs
- ensure that the cannula is properly inserted and patent prior to infusion
8 Oral glucose treatment

Quick info:

• 10-20g glucose
• 120mL of orange juice (10-15g glucose); consider adding granulated sugar (teaspoon = 5g glucose)
• glucose tablets (usually 5g/tablet)
• honey or maple syrup

References:
Emergency Care Specialist Library, Joint Royal Colleges Ambulance Liaison Committee (JRCALC). Glycaemic emergencies.

9 Inadequate response

Quick info:

• glucose should be administered until blood glucose level is at least 5.0 mmol/L

10 Satisfactory response

Quick info:

• glucose should be administered until blood glucose level is at least 5.0 mmol/L

11 Inadequate response

Quick info:

• glucose should be administered until blood glucose level is at least 5.0 mmol/L

12 Satisfactory response

Quick info:

• glucose should be administered until blood glucose level is at least 5.0 mmol/L

13 Repeat oral glucose treatment up to 3 times

Quick info:

Reference:
Emergency Care Specialist Library, Joint Royal Colleges Ambulance Liaison Committee (JRCALC). Glycaemic emergencies.
14 Feed meal with complex carbohydrates

Quick info:
• ensures longer lasting effect of hypoglycaemia treatment

Reference:

15 Establish 10% dextrose infusion

Quick info:
• 3mL/Kg body weight/hour

16 Feed meal with complex carbohydrates

Quick info:
• ensures longer lasting effect of hypoglycaemia treatment

Reference:

18 Patient education and counselling

Quick info:
Discuss with the patient:
• any modification in medications to reduce the risk of further hypoglycaemia
• how to recognise the symptoms of hypoglycaemia
• the role of alcohol in increasing the risk of hypoglycaemia
• the effect of exercise on blood glucose levels and glucose and insulin intake in relation to this
• the effect of illness on blood glucose levels
• the importance of regular meals

Reference:
PRODIGY. Diabetes Type 2 – blood glucose management. Newcastle upon Tyne: PRODIGY; 2005.

19 Consider empirical steroids

Quick info:
• IV bolus of hydrocortisone 1-2mg/kg every 6 hours
• consider adrenal insufficiency

20 Hypoglycaemia awareness

Quick info:
• failure to sense warning signs of impending hypoglycaemia
• unable to pre-empt progression by taking glucose
• hypoglycaemia-associated autonomic failure may facilitate hypoglycaemic unawareness – defective glucose counter-regulation (loss of glucagon and sympathetic responsiveness)
• in intensive treatment regimens, lower blood glucose levels may be required to elicit autonomic responses
23 Patient education and counselling

Quick info:
Discuss with the patient:
• any modification in medications to reduce the risk of further hypoglycaemia
• how to recognise the symptoms of hypoglycaemia
• the role of alcohol in increasing the risk of hypoglycaemia
• the effect of exercise on blood glucose levels and glucose and insulin intake in relation to this
• the effect of illness on blood glucose levels
• the importance of regular meals
Reference:
PRODIGY. Diabetes Type 2 – blood glucose management. Newcastle upon Tyne: PRODIGY; 2005.

24 Attempt to reverse state of unawareness

Quick info:
• scrupulous avoidance of iatrogenic hypoglycaemia for a few weeks:
  • may restore state of awareness
  • partially restore adrenergic response to hypoglycaemia
Reference:

25 Search for cause of severe hypoglycemia

Quick info:
Causes include:
• accidental or intentional excessive insulin
• over-intensive attempts to control glycaemia
• reduced calorie intake or malabsorption
• excessive exercise
• infection with anorexia
• vomiting
• increased insulin sensitivity with weight loss
• drugs increasing insulin sensitivity (eg. Biguanides and glitazones)
• drugs impairing hyperadrenergic response to hypoglycaemia (eg. beta blockers)
• impaired hepatic gluconeogenesis or glycogenolysis (eg. alcohol)
• reduced insulin clearance in renal failure
• adrenal insufficiency
References:
PRODIGY. Diabetes Type 2 – blood glucose management. Newcastle upon Tyne: PRODIGY; 2005.

26 Search for cause of hypoglycaemia

Quick info:

Last reviewed: 30-Oct-2008   Due for review: 31-Aug-2010   Printed on: 20-Aug-2009   © Map of Medicine Ltd

IMPORTANT NOTE
Last reviewed refers to the date of completion of the most recent review process for a pathway. All pathways are reviewed regularly every twelve months, and on an ad hoc basis if required.
Causes include:

- accidental or intentional excessive insulin
- over-intensive attempts to control glycaemia
- reduced calorie intake or malabsorption
- excessive exercise
- infection with anorexia
- vomiting
- increased insulin sensitivity with weight loss
- drugs increasing insulin sensitivity (e.g., Biguanides and glitazones)
- drugs impairing hyperadrenergic response to hypoglycaemia (e.g., beta blockers)
- impaired hepatic gluconeogenesis or glycogenolysis (e.g., alcohol)
- reduced insulin clearance in renal failure
- adrenal insufficiency

References:


PRODIGY. Diabetes Type 2 – blood glucose management. Newcastle upon Tyne: PRODIGY; 2005.


27 Make appropriate adjustments

Quick info:

- treat the cause of the hypoglycaemia if possible (e.g., antibiotics for infection)
- modify dose, type and mode of delivery of insulin or oral hypoglycaemic agent if appropriate
- two systematic reviews indicate that some insulin analogues may have a decreased rate of hypoglycaemic episodes compared to human insulin
- however, two other systematic reviews indicate no difference in the frequency of hypoglycaemic episodes between human and animal insulin
- subcutaneous insulin infusion pumps may reduce the frequency of hypoglycaemic episodes; however, they may increase the frequency of ketoacidosis if the pump fails or is blocked
- intensive insulin treatment may increase frequency of hypoglycaemic episodes
- combining oral hypoglycaemics increases the risk of a hypoglycaemic episode

References:


28 Make appropriate adjustments

Quick info:

- treat the cause of the hypoglycaemia if possible (e.g., antibiotics for infection)
- modify dose, type and mode of delivery of insulin or oral hypoglycaemic if appropriate
- two systematic reviews indicate that some insulin analogues may have a decreased rate of hypoglycaemic episodes compared to human insulin

IMPORTANT NOTE
Last reviewed refers to the date of completion of the most recent review process for a pathway. All pathways are reviewed regularly every twelve months, and on an ad hoc basis if required.
• two systematic reviews indicate no difference in the frequency of hypoglycaemic episodes between human and animal insulin
• subcutaneous insulin infusion pump may reduce the frequency of hypoglycaemic episodes (though it may increase the frequency of ketoacidosis which can occur if the pump fails or blocks)
• intensive insulin treatment by multiple doses injection may increase frequency of hypoglycaemic episodes
• combining oral hypoglycaemics increases the risk of a hypoglycaemic episode

References:
Evidence summary for Hypoglycaemia - treatment in diabetic patients

The pathway is based on our interpretation of the following guidelines (1, 2). All of these guidelines have been graded for quality and prioritised for inclusion based on their methodological quality. All intervention nodes (i.e. those concerning therapy and therapeutic advice) have been graded for the quality of the evidence underlying them (see table 1).

Search date: Nov-2005

Evidence grades:

1. Intervention node supported by level 1 guidelines or systematic reviews
2. Intervention node supported by level 2 guidelines
3. Intervention node based on expert clinical opinion
U. Non-intervention node, not graded

Evidence grading:

<table>
<thead>
<tr>
<th>Graded node titles that appear on this page</th>
<th>Evidence grade</th>
<th>Reference IDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Give intravenous glucose or parenteral glucagon</td>
<td>2</td>
<td>1, 2</td>
</tr>
<tr>
<td>Search for cause of severe hypoglycemia</td>
<td>1</td>
<td>1, 2, 3, 4, 5, 6, 12</td>
</tr>
<tr>
<td>Make appropriate adjustments</td>
<td>1</td>
<td>8, 11, 9, 10, 7, 12</td>
</tr>
<tr>
<td>Oral glucose treatment</td>
<td>2</td>
<td>1, 2</td>
</tr>
<tr>
<td>Repeat oral glucose treatment up to 3 times</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Feed meal with complex carbohydrates</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Patient education and counselling</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Attempt to reverse state of unawareness</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Search for cause of hypoglycaemia</td>
<td>1</td>
<td>1, 2, 3, 4, 5, 6, 12</td>
</tr>
<tr>
<td>Make appropriate adjustments</td>
<td>1</td>
<td>8, 11, 9, 10, 7, 12</td>
</tr>
</tbody>
</table>

References

Last reviewed: 30-Oct-2008  Due for review: 31-Aug-2010  Printed on: 20-Aug-2009  © Map of Medicine Ltd

IMPORTANT NOTE
Last reviewed refers to the date of completion of the most recent review process for a pathway. All pathways are reviewed regularly every twelve months, and on an ad hoc basis if required.
This is a list of all the references that have passed critical appraisal for use in the pathway Hypoglycaemia

**ID**

4. PRODIGY. Diabetes Type 2 - blood glucose management. Newcastle upon Tyne: PRODIGY; 2005.

**Disclaimers**

NHS Institute for Innovation and Improvement

It is not the function of the NHS Institute for Innovation and Improvement to substitute for the role of the clinician, but to support the clinician in enabling access to knowledge and knowledge. Users of the Map of Medicine are therefore urged to use their own professional judgement to ensure that the patient receives the best possible care. Whilst reasonable efforts have been made to ensure the accuracy of the information on this online clinical knowledge resource, we cannot guarantee its correctness or completeness. The information on the Map of Medicine is subject to change and we cannot guarantee that it is up-to-date.

BMJ Publishing Group Ltd

The updates supplied by the BMJ toward the Evidence Summary are prepared by systematically reviewing certain published medical research and guidelines relevant to the topics covered, as agreed with Map of Medicine Ltd. Readers should be aware that professionals in the field may have different opinions and not all studies are covered. Because of this fact and also because of regular advances in medical research, we strongly recommend that readers independently verify any information they chose to reply on. Ultimately it is the readers' responsibility to make their own professional judgements. The BMJ Publishing Group Ltd does not independently verify the accuracy of the published research or guidelines and is not responsible for changes being made within the Map of Medicine as a result of the evidence. The updates to the Evidence Summaries are supplied on an "as is" basis without warranty of any kind express or implied and to the fullest extent permitted by law, accepts no liability for losses, injury or damage caused to any person or property (including under contract, by negligence, products liability or otherwise) whether they be direct or indirect, special, incidental or consequential, resulting from the application the information, errors or omissions in the updates supplied for Evidence Summary, the Evidence Summary, the Pathways covered by it or the research referred to in it.