



IAEM Clinical Guideline

Management of Patients with Hypoglycaemia in the Emergency Department

Version 1.0

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DISCLAIMER

IAEM recognises that patients, their situations, Emergency Departments and staff all vary. These guidelines cannot cover all clinical scenarios. The ultimate responsibility for the interpretation and application of these guidelines, the use of current information and a patient's overall care and wellbeing resides with the treating clinician.

Revision History	Section	Summary of Changes	Author
Final version V1.0	All		

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GLOSSARY OF TERMS

ACTH	Adrenocorticotrophic Hormone
BSL	Blood Sugar Level
CVA	Cerebrovascular Accident
CNS	Clinical Nurse Specialist
CRP	C-Reactive Protein
CT	Computed Tomography
CXR	Chest X-ray
DM	Diabetes Mellitus
ECG	Electrocardiogram
ED	Emergency Department
FBC	Full Blood Count
FSH	Follicle Stimulating Hormone
GCS	Glasgow Coma Scale
GH	Growth Hormone
LFT	Liver Function Tests
LH	Luteinising Hormone
NDLS	National Driver Licence Service
TSH	Thyroid Stimulating Hormone
U&E	Urea and Electrolytes
VBG	Venous blood gas

Management of Patients with Hypoglycaemia in the Emergency

Department

INTRODUCTION

Hypoglycaemia is rare in patients who do not have medication-controlled Diabetes Mellitus (DM). It can be precipitated by numerous factors including infection / sepsis, toxin ingestion, significant and prolonged episodes of malnutrition / starvation or in patient populations associated with low glycogen stores (older patients, chronic kidney disease, liver disease, alcohol abuse).

Hypoglycaemia is common in patients with insulin, or insulin secretagogue, treated DM and this forms the majority of patients presenting to the ED with low blood sugar levels (BSL).

The main causes of hypoglycaemia can be recalled using a simple mnemonic: 'EXPLAIN'

- **Exogenous** insulin (or an oral hypoglycaemic agent, e.g. sulphonylurea)
- **Pituitary** pathologies
- **Liver** disease
- **Addison's** disease
- **Insulinoma**
- **Non-pancreatic** tumours

Hypoglycaemia can be defined in 3 parameters:

1. Biochemical definition of hypoglycaemia
 - a. Hypoglycaemia is defined as blood glucose level $<4\text{mmol/L}$.
 - b. Severe hypoglycaemia is defined as blood glucose level $<2.2\text{mmol/L}$
2. Clinical definition of hypoglycaemia
 - a. Symptoms and signs of low blood glucose level, as described below.
3. Clinically-significant hypoglycaemia
 - a. Hypoglycaemia requiring third party intervention for management.

Symptoms of hypoglycaemia are classified as neuroglycopenic or autonomic, and are listed below. Some patients, particularly those with Type 1 DM for a number of years; on beta-blocker medication; with poor mental health or with a history of alcohol abuse, may have hypoglycaemia unawareness, and therefore may not present with typical symptoms.

Symptoms of hypoglycaemia	
Neuroglycopenic	Autonomic
Concentration difficulties	Sympathomimetic, e.g. palpitations, tremor, anxiety
Confusion	Cholinergic, e.g. hunger, nausea, diaphoresis
Confabulation	
Convulsions	
CVA-like symptoms, e.g. visual / speech deficits, dizziness, weakness	
Coma	

PARAMETERS

Target audience: All clinical staff working in an ED involved in the assessment and care of patients over 16 years-old presenting with symptoms and/or signs suggestive of hypoglycaemia.

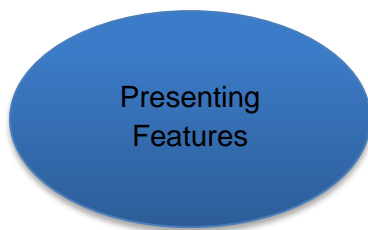
Patient population: Symptomatic or asymptomatic patients aged 16 years or older presenting to the ED with blood glucose level less than 4mmol/L, with or without a pre-existing diagnosis of DM.

Exclusion criteria: Paediatric patients less than 16 years-old.

AIMS

The aim of this document is to provide guidance to clinical staff involved in the first-line assessment and management of adult patients presenting with symptoms and/or signs of hypoglycaemia.

ASSESSMENT



- BSL <4mmol/L on finger-prick glucose test or VBG
- Diaphoresis, trembling, palpitations, anxiety, nausea
- Headache, dizziness, confusion or difficulty concentrating, blurred vision



- Look for 'red flags' for severe hypoglycaemia
- Assess patient's ability to protect own airway if reduced level of consciousness or vomiting
- Assess for possible aetiology of hypoglycaemia:
 - Evaluate hydration status
 - Examine for signs of infection
 - If evidence of sepsis, start Adult Sepsis form and manage accordingly, alongside hypoglycaemia treatment
 - Aim to identify specific toxidrome if concerned
 - Heart rate
 - Respiratory rate and quality
 - Pupil size and responsiveness
 - Muscle tone or abnormal movements
 - Skin moisture
 - Any evidence of drug paraphernalia on patient's body or in clothing
 - Examine for signs of malnutrition or alcohol abuse



- Seizure activity
 - Unconsciousness or falling GCS
 - Agitation/combativeness
- *If any of the above features are noted, inform senior doctor if not already present

Figure 1: Suggested assessment flow for patients presenting with hypoglycaemia.

INVESTIGATIONS

Blood tests

- Diagnosis
 - Finger-prick glucose test or venous blood gas (VBG) to confirm hypoglycaemia
 - It is often not feasible to delay treatment of hypoglycaemia to facilitate collection of blood sample for laboratory glucose level.
- Search for cause
 - Exogenous insulin and toxin ingestion
 - Glucose level, insulin level, C-peptide level (inform lab).
 - Paracetamol level, salicylate level, and/or relevant levels if the history is suggestive.
 - Pituitary pathologies
 - ACTH and cortisol level
 - May consider other pituitary hormone levels if high suspicion, e.g. GH, FSH/LH, TSH, prolactin
 - Liver disease, alcohol misuse
 - LFT, amylase
 - If suspected, vitamin replacement and other supportive therapy may be indicated.
 - Addison's disease
 - Cortisol level, U&E, bone profile
 - Infection
 - FBC, CRP, blood cultures
 - If suspected, infection should be treated with appropriate antibiotics, fluid therapy, etc., concomitantly with the hypoglycaemia.

Urine tests

- Urine dipstick
 - May demonstrate infection, signs of renal disease or dehydration.
 - Urine should be sent for culture and sensitivity if suspicious for infection.
- Urine toxicology screen.
- Urine pregnancy test in all females of child-bearing age.

ECG

- Cardiac monitoring should be continuous during correction of any electrolytes or in any systemically unwell patient in the ED.
- ECG is particularly important if suspecting a toxicological cause for hypoglycaemia or if giving anti-emetic medication for nausea / vomiting.

CXR

- CXR should be performed as part of a septic screen in patients with suspected infection or where aspiration is a concern.

CT Brain

- CT brain may rarely be indicated in patients with severe hypoglycaemia where symptoms / signs such as low GCS or seizures fail to recover with correction of BSL or if concern exists for an intracranial infection.
- CT Brain may also identify a pituitary tumour as the aetiology of hypoglycaemia.

MANAGEMENT

A proposed initial management algorithm for hypoglycaemia is outlined below ([Figure 2](#)). Approach to all unwell patients in the ED begins with management of any identified issues pertaining to the patient's airway, breathing, circulation, disability, and temperature. Once this has been addressed, the next most important determining features to ascertain are the patient's ability to tolerate oral intake and to co-operate with medical treatment. Based on these factors, you will follow the proposed pathways for mild; moderate or severe hypoglycaemia.

It is important to note that the clinical condition of a patient is dynamic and a patient's presentation may change quite rapidly. Thus, repeated assessment of a patient is required to ensure the patient is safely and appropriately managed.

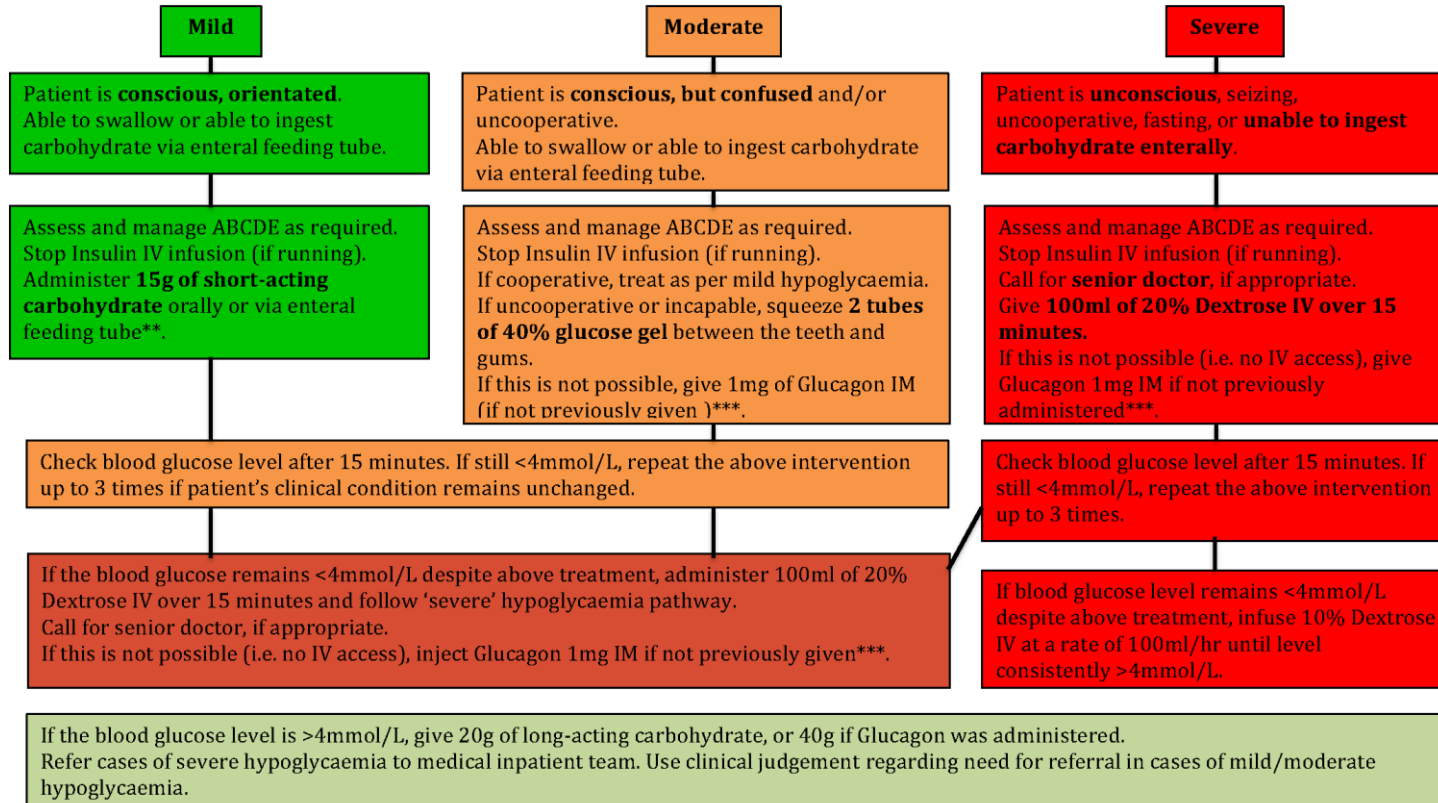
Any patients presenting with severe hypoglycaemia should ideally be managed by a senior clinician in the ED, as soon as this condition is identified. Patients with mild / moderate hypoglycaemia who are failing to respond to initial treatment measures should be flagged to a senior clinician for review and advice regarding ongoing treatment.

Certain patients present a risk for recurrent or prolonged hypoglycaemia, e.g. patients with overdose (intentional or unintentional) of long-acting insulin or patients taking sulphonylureas with underlying low glycogen stores (chronic kidney disease, older patients, liver disease). These patients should not be immediately discharged from the ED following treatment of an acute hypoglycaemic episode. These patients should be referred to the medical team on-call for ongoing inpatient management and monitoring. A weaning insulin regimen may be indicated for these patients following acute treatment (e.g. 10% dextrose IV 100ml/hr → 80ml/hr → 60ml/hr until BSL consistently >4mmol/L and patient taking enteral carbohydrate

HYPOGLYCAEMIA MANAGEMENT

Hypoglycaemia is defined as blood glucose level <4.0mmol/L, and should be treated as an emergency.

If a patient is symptomatic of hypoglycaemia with blood glucose level >4.0mmol/L, give 15g of long-acting carbohydrate for symptom relief*.



*15g of **long-acting** carbohydrate is equivalent to 2 plain digestive biscuits, or a slice of bread/toast, or 200ml of full-fat milk.

15g of **short-acting carbohydrate is equivalent to 5-7 DextroEnergy tablets, or 200ml of Lucozade Original drink, or 150ml of pure fruit juice. For patients with enteral feeding tubes, give 110-150ml of Fortijuce (or similar) followed by a 40-50ml water flush.

***Glucagon may take up to 15 minutes to work. **Glucagon should NOT be given more than once.**

Figure 2. Algorithm for Management of Hypoglycaemia in the Emergency Department

SPECIAL CONSIDERATIONS

Glucagon

- Glucagon may take up to 15 minutes to take effect, and should not be administered more than once.
- Glucagon may not work in certain patient populations, including those with severe liver disease, malnourished patients, patients suffering from sulphonylurea-induced hypoglycaemia, and patients with repeated hypoglycaemic events.

Disposition

- In the case where a diabetic patient has been successfully treated for mild / moderate hypoglycaemia and is deemed fit for discharge without referral to medical inpatient team, consider link with diabetes CNS if possible; advise patient to link with own diabetes team if relevant or provide education to the patient prior to discharge regarding avoidance, recognition, and self-management of hypoglycaemia.
- In patients with first presentation of unexplained hypoglycaemia, the medical team should be consulted for further investigation and follow-up.

Driving

- Patients who have suffered more than one severe hypoglycaemic episode must notify the NDLS, unless they are a commercial driver in which case any single episode of severe hypoglycaemia must be communicated to the NDLS.
- Patients with hypoglycaemia unawareness are deemed unfit to drive, and this should be explained to patients presenting as such to the ED.

Ongoing management

- While this document may be consulted by healthcare professionals from a range of medical specialities, it is intended for use in the ED and is not comprehensive to include ongoing inpatient care of patients initially presenting with a hypoglycaemic event. Other factors including but not limited to medication review and patient education are beyond the scope of this guideline.

Pregnancy

- While this guideline can be applied to pregnant women presenting with acute hypoglycaemia, further guidance may be required from an Obstetrics team member regarding ongoing care and/or need for foetal assessment.

Sulphonylurea-induced hypoglycaemia

- Octreotide may be considered in the management of sulphonylurea-induced hypoglycaemia following consultation with a senior Endocrinology team member.

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