1. Introduction and Who Guideline applies to

1.1 This document sets out guidance for the hospital management of hypoglycaemia in adults with diabetes mellitus (DM). It is based on the revised Joint British Diabetes Societies (JBDS) guideline 'The Hospital Management of Hypoglycaemia in Adults with Diabetes Mellitus (revised 2022).

1.2 Hypoglycaemic episodes are common, particularly with Type 1 DM and may also occur in patients with Type 2 DM treated with insulin or sulphonylureas. Hypoglycaemia in Type 2 DM is more common in the elderly and those with renal impairment.

1.3 "Looming" hypoglycaemia is now recognised in vulnerable groups of patients Care should be individualised in this group of patients.

2. Guideline Standards and Procedures

This guideline applies to all adult inpatients with DM and to all Healthcare Professionals who care for these patients.

Hypoglycaemia should be excluded in any person with DM who is unwell, drowsy, unconscious, unable to co-operate, or presenting with aggressive behaviour or seizures. It is the most common side effect relating to the use of insulin and sulphonylureas and can often occur overnight.

2.1 Definition

Hypoglycaemia is defined as a blood glucose level that is lower than normal. For adult hospital inpatients, a blood glucose level of less than 4.0 mmol/L should be treated.

2.2 Establishing the diagnosis of hypoglycaemia

Hypoglycaemia is determined by a near patient capillary blood glucose (CBG) measurement of <4.0mmol/l, performed by staff trained in the procedure.

The following may indicate a hypoglycaemic episode and should prompt confirmation by capillary blood glucose measurement as above:

- General malaise – headache, nausea
- Autonomic symptoms – pallor, sweating, tremor, tachycardia
- Neuroglycopaenic symptoms – loss of concentration, behavioural changes, fits, transient neurological deficits, reduced level of consciousness
- Some patients especially with long standing Type 1 DM may lose their awareness of hypoglycaemia, which means they may not experience the autonomic 'warning symptoms' thus putting them at higher risk of developing severe hypoglycaemia.
- Symptoms may be more nebulous in the elderly

2.3 Risk factors for hypoglycaemia

Medical Issues	Lifestyle Issues
Tight glycaemic control	Increased exercise (relative to usual)
Previous history of severe hypoglycaemia	Irregular lifestyle
Undetected nocturnal hypoglycaemia	Increasing age
Long duration of DM	Alcohol
Poor injection technique	Early pregnancy
Impaired awareness of hypoglycaemia	Breast feeding
Preceding hypoglycaemia (<3.5mmol/l)	Injection into areas of lipohypertrophy (lumpy injection sites)
Severe hepatic dysfunction	Inadequate blood glucose monitoring
Renal dialysis therapy	**Reduced carbohydrate intake** - eg, coeliac disease, gastroenteritis
Impaired renal function	
Inadequate treatment of previous hypoglycaemia	
Terminal illness	
Bariatric surgery involving bowel resection	

2.4 Potential causes of inpatient hypoglycaemia

Medical Issues	Reduced Carbohydrate Intake
Inappropriate use of “stat” / “prn” quick acting insulin	Missed or delayed meals
Discontinuation of long term steroid therapy	Less carbohydrate than normal
Recovery from acute illness / stress	Change of the time of the biggest meal of the day, ie, main meal at midday rather than evening
Mobilisation after illness	Lack of access to usual between meal or before bed snacks
Major amputation of a limb	Prolonged starvation time eg, NBM
Inappropriately timed DM medication for meal / enteral feed	Vomiting
Incorrect insulin prescribed and administered	Reduced appetite
IV insulin infusion with or without glucose infusion	Reduced carbohydrate intake
Inadequate mixing of intermediate acting or mixed insulins	
Regular insulin doses being given in hospital when these are not routinely taken at home	

Please also see section 2.10 ‘Risk factors for hypoglycaemia’ for those on enteral / parenteral feeds

2.5 “Looming” Hypoglycaemia

The Threashold for hypoglycaemia remains at less then 4.0mmol/L, for people with diabetes in hospital (PWDiH). However, it may be appropriate to act proactively to prevent hypoglycaemia – especially where vulnerable patients are involved. This is especially relevant for those on glucose lowering medications such as suphfonylureas (e.g Glicalzide) or insulin therapy. Continued CBG

level of between 4.0 - 6.0mmol/L could indicate looming hypoglycaemia particularly if CBGs are consistently below 6.0mmols/L. If the PWDiH is fasting for a procedure or operation then IV insulin should be considered to reduce the risk of the procedure or operaton being postponed.

NB Any patient identified with looming hypoglycaemia CBGs should be persoanlised to suit the patient circumstances of the PWDiH and their individual risk of hypoglycaemia. A proactive adjustment of diabetes treatment between the PWDiH, clinican and the inpatient diabetes team should be sought.

2.6 Treatment of hypoglycaemia

See hypoglycaemia treatment algorithm. A person experiencing hypoglycaemia requires quick acting carbohydrate (CHO) to return their blood glucose to the normal range, followed by a long acting CHO to maintain their blood glucose within the normal range (see 3.8.3 below). **Treatment should be commenced without delay Please note Dextrose tablets should be sucked or chewed.**

2.6 Hypo boxes

A 'Hypobox' contains all the equipment required to treat hypoglycaemia. The box should be kept in a prominent place on the Ward / Department e.g treatment room. It is the responsibility of the individual Ward / Department to ensure that the box is re-stocked after use (See below for list of contents). A sticker should be used to seal the box with date sealed clearly displayed – first expiry date can be noted to save unsealing the box on a daily basis. This should be checked daily.

Contents	Quantity per Box	Order numbers
Laminated copy of Hypoglycaemia algorithm	1	Provided in box
Laminated copy of box contents	1	Provided in box
Glucose juice bottle (15g carbohydrate)	3	Order via NHS Supply Chain
Packet of Dextrose tablets	2	Pharmacy
Glucose 40% gel (GlucoBoost/Glucogel)	3	Pharmacy
Mini packet of Biscuits	3	Order via NHS Supply Chain
Glucagon	1	Pharmacy (Can be stored at room temperature, up to 25 degrees for 18 months- expiry date will be endorsed by pharmacy at point of supply)
20% IV glucose infusion bag (500ml)	1	Pharmacy

2.7 Hypoglycaemia treatment algorithm

The flow chart on the following page describes the treatment of hypoglycaemia. (N.B. from June 2017, due to a reformulation, UHL no longer uses Lucozade to treat hypoglycaemia). Glucojuice is the preferred choice of hypoglycaemia treatment.

2.8 Special considerations

2.8.1 Administering IV glucose

- Infusion should ideally be through a large vein. If a patient requires IV glucose 20% infusion for more than 24 hrs then change cannula site every 24 hours (See Appendix 1).
- Volume of infusion should be determined by clinical circumstances, e.g. in renal failure or cardiac disease then smaller volumes may be required

2.8.2 Glucagon

- Should only be used once during treatment of a hypoglycaemic episode
- Effect will wear off after approx 30 minutes
- Patients given glucagon will require a larger portion of long acting CHO to replenish glycogen stores
- Glucagon will not be effective in patients with liver disease, glucocorticoid deficiency or who have been malnourished or starved.
- Alcohol related hypoglycaemia may be resistant to glucogon due to malnutrition and inhibition of glycogenesis

2.8.3 Suitable long acting carbohydrate (CHO) snack

- Pack of mini digestive biscuits
- 1 slice bread / toast
- 200-300ml milk (not soya)
- normal meal (must contain CHO)
- gluten free:
    - Pack of Mrs Crimbles Jam and Coconut Ring biscuits
    - Gluten free cornflakes (not Kellogs)

2.8.4 Intravenous insulin and hypoglycaemia

If IV insulin in situ and patient experiences hypoglycaemia:

- stop insulin infusion
- treat hypoglycaemia
- when capillary blood glucose (CBG) >4.0mmol/l restart IV insulin infusion after reviewing the prescribed rate

2.8.5 Blood glucose less than 2.6mmols/L

ESCALATE

If IV access as hypoglycaemia in adults Algorithm (see below)

- Administer 100ml bolus of 20% glucose administered via pump (braun) set to 400mls per hour - run for 15 mins.
- Re-check CBG after 10mins
- If no response consider repeating IV bolus or run 20% glucose 50ml/hr

No IV access consider using Glucagon IM

- Repeat CBG after 20 mins
- Secure IV access
- If no response treat with 20% IV glucose and escalate
- If recovering treat as hypoglycaemia in adults Algorithm (see below)

Algorithm for the treatment of Hypoglycaemia in Diabetic Adults

NHS
University Hospitals of Leicester
NHS Trust

Treat if blood glucose is less than 4mmols/L

With or without symptoms: Sweating, Trembling, Feeling of hunger, Anxiety, Poor concentration, Palpitations, Tingling of lips, Pale, Vague/confused, Convulsions, Coma

MILD	MODERATE	SEVERE
Adults who are conscious, orientated and able to swallow	**Patients conscious and able to swallow, but confused, disorientated or aggressive**	**Patients unconscious/aggressive/Nil by mouth (NBM) CBG less than 2.6mmols/L**
IV insulin in situ STOP		
Give fast acting CHO, either: • Glucojuice (preferred) • 1 bottle (60mls) Lift juice shot (preferred) • 5 - 7 dextrose tablets	**If capable and cooperative,** treat as for mild Hypoglycaemia. **If not capable and cooperative but can swallow** give: 2 tubes of Glucose gel, (squeezed into mouth between the teeth & gums)	Check ABCDE, STOP IV insulin escalate to Dr. Secure IV access: If required Administer: 100ml 20% glucose over 10-15mins (using braun pump set pump at 400mls/hr stopped after 15mins) In the absence of IV access Consider administering Glucagon IM*
Test blood glucose after 10-15mins and if still less than 4mmols/L repeat cycle to a maximum of 3 times. If still hypo consider 1mg Glucagon IM* or 50ml/hr of 20% IV glucose escalate as appropriate.		
CBG above 4mmols/L, patient is conscious, orientated and able to swallow, give longer action carbohydrate, either: cereal/biscuits/yogurt. **For patients with coeliac disease,** give suitable alternative gluten free carbohydrate snack. Or next meal if due. ⚠ **DO NOT OMIT INSULIN INJECTION IF DUE GIVE AFTER THE MEAL – IF ON IV INSULIN RESTART** ⚠		Re-check CBG after 10 mins if CBG remains less than 4mmols/L repeat IV glucose or consider glucose infusion of 50ml/hr
Re-check CBG in 30-60mins and record all treatment on the hypoglycaemia chart on Nerve Centre Monitor CBGs regularly for the next 24-48 hrs		Recheck CBG and medical review **RESTART IV INSULIN INFUSION ONCE CBG >4MMOLS/L**

*Glucagon IM should only be administered once , and can take up to 15-30 minutes to take effect. In the absence of a prescriber, a PGD is in place for UHL Registered Nursing staff to administer.
Patients given glucagon require a larger portion of long acting carbohydrate to replenish glycogen stores – double the amount.

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2.9 When the hypoglycaemic episode has been treated

2.9.1 Documentation

- Document hypoglycaemic episode in patient's notes, on the green diabetes monitoring chart and Nerve Centre.
- If more than 3 episodes of hypoglycaemia e.g 3 consecutive days or 3 occasions on the same day after medical review – refer to the diabetes in-reach team via ICE.

2.9.2 Monitoring

- Consider risk factors and cause of hypoglycaemia
- Doctor/ACP who is Independent prescriber to review capillary blood glucose record if available and consider whether DM treatment should be reduced
- **Do not omit next usual dose of insulin**
- Do not treat isolated spikes of hyperglycaemia with "stat" doses of quick acting insulin. Review capillary blood glucose record and adjust usual DM treatment if a pattern is evident. Use insulin titration tool for guidance (found on INSITE diabetes page)
- Patients should be advised to check their capillary blood glucose concentration regularly for the next 48 hours, as an episode of hypoglycaemia increases the risk of further hypoglycaemia during this time. This may be done at home if patient safe for discharge.

2.9.3 Referral to In-reach diabetes team

Refer to In-reach diabetes team electronically via ICE for hypoglycaemia education

2.9.4 Admission / Discharge

- Patients with Type 1 DM often do not require admission. Patients with Type 2 DM on sulphonylureas may need admitting as risk of hypoglycaemia can persist for 24-48 hours and a glucose infusion may be required. Patients requiring inpatient care should be triaged to specialist diabetes ward.
- Patients with Type 1 DM (especially pregnant women) should be prescribed Glucogel® and glucagon when discharged to use at home if necessary. Family and friends need to be instructed in their use.
- See 'Pathway for Adult Patients with Diabetes attending the Emergency Department (ED) with Hypoglycaemia' if patients present to the ED with hypoglycaemia

2.10 Adults requiring Parenteral feeds

Patients requiring total parenteral nutrition (TPN) should be referred to a dietician/nutrition team and diabetes team for individual assessment

2.10.1 Risk factors for hypoglycaemia:

- blocked/displaced tube (enteral)
- change in feed regimen, enteral feed discontinued
- PN or IV glucose discontinued
- DM medication given at inappropriate time to feed
- changes in medications that cause hyperglycaemia e.g. steroid therapy reduced / stopped

- feed intolerance
- vomiting
- deterioration in renal function
- severe hepatic dysfunction

2.10.2 Treatment to be administered via enteral feed tube **(do not administer via the dedicated PN line)**

- Give 15-20g quick acting CHO:
    - 60ml Glucose juice (Lift®)
    - 50-70ml Fortijuice® or Ensure Plus® juice
    - 3-4 heaped teaspoons sugar dissolved in water
- Check CBG every 15 minutes and repeat above up to 3 times if CBG remains <4.0mmol/l
- If CBG remains <4.0mmol/l after 45 minutes then consider iv glucose infusion
- When CBG >4.0mmol/l and patient recovered give long acting CHO:
    - restart feed
    - if bolus feeding give additional bolus – amount required to give 20g CHO
    - 10% IV glucose infusion 100ml/hr (see Appendix 1)
- Do not omit usual insulin injection if due

2.11 Nursing Interventions

- Observations – hourly then every 2-4 hours once clinically stable. Check pulse, blood pressure, temperature, respiratory rate, oxygen saturations and CBG in accordance with EWS.
- Urinary catheter if present – hourly measurement
- Fluid balance
- Food chart (if appropriate)
- Mouth care – great possibility patient will be 'nil by mouth'
- Care of IV insulin infusion if present
- Electronic referral to In-Reach diabetes team
- Ensure usual insulin is administered as prescribed – remember usual dose may need reviewing by doctor or DSN
- Administer IV fluid as prescribed
- Care of pressure areas – patient may have reduced consciousness or impaired mobility

3. Education and Training

All clinical staff working in any location within UHL would be expected to seek support from a senior peer or member of the diabetes team if they if they were presented with a patient with hypoglycaemia and they did not feel adequately trained to manage the situation.

All medical, nursing and pharmacy staff grade 5 and above are required to complete essential to job role training HELM eLearning, on Insulin Safety, this includes treatment of hypoglycaemia.

4. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Incidence of hypoglycaemia within the Trust	National Diabetes Inpatient Audit (NaDIA) and continual NaDIA incidents reporting	Chair of the Diabetes inpatient safety committee (DISC)	Quaterly of mini NaDiaAt least annually	National report by NaDia Team
Appropriate dose adjustment of blood glucose lowering medication in response to hypoglycaemia to prevent further episodes	Quarterly UHL mini NaDIA audit. National Diabetes Inpatient Audit (NaDIA) and continual NaDIA incidents reporting	Chair of the Diabetes inpatient safety committee (DISC)	Quarterly of UHL mini NaDIA audit to EQB & DISC At least annually	National report by NaDia Team

5. Supporting References

Joint British Diabetes Societies (JBDS) The Hospital Management of Hypoglycaemia in Adults with Diabetes Mellitus (revised March 2022). Available at:

https://abcd.care/sites/abcd.care/files/site_uploads/JBDS_Guidelines_Current/JBDS_01_HypoGuideline%20_March_2022.pdf

Pathway for Adult Patients with Diabetes attending the Emergency Department (ED) with Hypoglycaemia

http://insitetogether.xuhl-tr.nhs.uk/pag/pagdocuments/Hypoglycaemia%20UHL%20Emergency%20Department%20Guideline.pdf

6. Key Words

Hypo

Hypoglycaemia

Hypoglycaemic

Glucagon

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Helen Atkins Advanced Nurse Practitioner-Diabetes Dr Sowmya Setty – Diabetes Consultant	**Executive Lead** Mr Andrew Furlong – Medical Director
Details of Changes made during review: Amended in line with national guidance (JBDS, 2022) see above for reference – Looming hypoglycaemia risk (section 2.5) and changes to amount of IV glucose and volume change seen on flow chart and in section 2.8.5.	

APPENDIX 1 – USE OF IV GLUCOSE SOLUTIONS IN THE MANAGEMENT OF HYPOGLYCAEMIA

Glucose is given intravenously in two settings.

- Firstly to provide a rapid supply of carbohydrate (sugar) for the initial treatment of hypoglycaemia in patients unable to take quick acting carbohydrate orally (patients who are unconscious or NBM).
    - In this situation a stat dose of iv glucose is usually given over 10-15 mins and the guideline recommends the use of 100ml 20% glucose given over 10-15mins (infusion rate of 400ml/hr **stopped after 15 mins**).
    - If 20% glucose is not available then 10% glucose can be given: 200ml 10% glucose given over 10-15 mins (infusion rate 800ml/hr **stopped after 15mins**).
- Intravenous glucose can also be prescribed to provide an ongoing supply of carbohydrate following the treatment of hypoglycaemia.
    - In this situation 20% glucose given at a rate of 50ml/hr may be used.
    - However if it is anticipated that a patient may need a prolonged IV glucose infusion then 10% glucose at a rate of 100ml/hr would be advised. This is in preference to a continual infusion of 20% glucose due to risk of infusion site thrombophlebitis