GUIDELINE FOR THE MANAGEMENT OF SPONTANEOUS
HYPOGLYCAEMIA

Reference: Hypoglycaemia

Version No: 1

Applicable to: All Children >1 day of age with Hypoglycaemia without metabolic condition or diabetes mellitus (see page one)

Classification of document: Guideline

Area for Circulation: Children’s Hospital for Wales

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Metabolic Team (Dr G Shortland)
Biochemistry staff
Current literature

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Disclaimer

These have been ratified at the Child Health Guideline Meeting, however clinical guidelines are guidelines only.
The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician.
If in doubt contact a senior colleague or expert.
Caution is advised when using guidelines after the review date.
Investigation of a child presenting with hypoglycaemia

- This guideline is for use in those children presenting with spontaneous hypoglycaemia.
- It is NOT for investigation of patients with known diabetes mellitus with hypoglycaemic episodes (or a known metabolic condition e.g. MCADD – these pts should have a patient held proforma / open access file)
- It should not be confused with the protocol for investigating a child with recurrent hypoglycaemia with a starvation test.
- Persistent symptomatic hypoglycaemia requires urgent investigation.

**Definition:** Laboratory Blood glucose ≤ 2.6mmol/L (in all age groups apart from the immediate neonatal period <24 hrs)

**Management**

(also see flow chart)

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<th>1. ABC</th>
<th>Note, if the BM is ≤ 3.0mmol/L on the point of care testing kit, a venous blood sample must be performed for laboratory analysis as the POCT kits are not as accurate ≤ 3.0mmol/L. If in doubt, collect the samples and treat the child using the guideline, especially if clinically symptomatic.</th>
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1. **ABC**

2. **Obtain the blood samples in the hypoglycaemia pack. AT TIME OF HYPOGLYCAEMIA, before IV glucose given….**

**Important points…**

- The bottles and capillary sampling tubes are in the hypoglycaemia kit so you don’t have to work out which bottles need filling. Kits are in fridges on all wards that care for children & in drawers in EU resus.
- All forms required for the screen are completed and in the hypoglycaemia kit.
- Remember to put the ammonia sample on ice and take to the lab immediately (please pre warn lab of sample coming).
- Remember to complete the patient details on the specimen forms.
- Take any extra bloods needed for the presentation of the patient relevant to their condition, e.g. FBC, UE, BC etc as these aren’t included in the hypoglycaemia kit.

3. **Correct hypoglycaemia** (see below)

4. **Collect next urine sample**

5. **Take a thorough history and examination** (there is a form in the hypoglycaemia pack to complete and put in notes: see later.)
Biochemical investigations

- Plasma glucose
- Insulin
- C Peptide
- Cortisol
- Plasma non-esterified fatty acids
- 3 hydroxybutyrate
- Blood gas
- Ammonia (needs to go on ice – either some in ward fridge or ask porters to get from maternity or theatres)
- Acylcarnitines (collect on a neonatal screening card)
- Plasma amino acids
- Urine organic acids (next urine passed, do not wait for urine sample before treating hypoglycaemia)
- Urine dip for evidence of ketones (as soon as practically possible)

How to correct the hypoglycaemia (also see flow chart)

Hypoglycaemia should be treated **urgently**. Where possible, always collect the blood samples at the time of the hypoglycaemia as this will aid diagnosis and avoid the need for re-admission and further investigations.

If the child is conscious and able to tolerate oral intake, give a trial of oral carbohydrates:

**Examples**

Begin with

- A milk feed if child less than 1 year
- 125-200ml ordinary soft drink / lucozade / diluted cordial / fruit juice (*not* sugar free)  
  or
- 2-3 teaspoons of sugar  
  or
- If not successful, consider 5-20mls of strong glucose solution orally / glucose gel (hypostop/dextrogel)

In most circumstances this will be enough to raise the blood sugar by over 2mmol/L

**Follow up within 15-20 minutes**  
(to prevent rebound hypoglycaemia)

- 1 slice bread  
  or
- Digestive biscuit  
  or
- Banana or apple  
  or
- 1 glass milk (300ml)  
  or

**Re check blood glucose (see flow chart)**
If the patient is unconscious / very unwell / symptomatic then

DO NOT attempt oral therapy

Call for senior assistance, crash bleep if necessary

- Give 2ml/kg 10% glucose IV (slowly) over 2-3 minutes

- **Follow on this bolus immediately** (risk of rebound hypoglycaemia) with IV infusion containing **10% dextrose** at a rate of:

  3 - 5ml/kg/hr (equivalent to 5 - 8.3 mg/kg/min)

- Re measure blood glucose after 5-15 minutes : if still hypoglycaemic, repeat the dextrose bolus of 2ml/kg 10%. Consider cannula not working/leaking, consider IV hydrocortisone if adrenal insufficiency possible. Inform consultant.

- If blood glucose ok, continue infusion of 10% dextrose (consider using a solution with saline in addition) and check glucose regularly (1/2 hourly initially then space out readings from 1-4 hours accordingly). Aim for blood glucose readings between 4-8mmol/L and no higher. (Dangers arise, not only from hypoglycaemia but from over-enthusiastic administration of hypertonic glucose solutions).

- If needing >8mg/kg/min infusion rate – inform endocrine / metabolic consultant as well as general consultant.

- Consider giving 100mg IV hydrocortisone in addition, as above.

- Do not give glucagon unless venous access is lost (0.5mg if <25Kg, 1mg if >25Kg)

After the emergency management has been completed and the child is stable, please complete the sheet of paper found in the hypoglycaemia kit and file it in the notes (ensuring specific questions in the history have been documented and also specific examination details are documented).

Complete the tick box table to ensure all samples have been taken and results chased up – this aids follow up clinic assessments and diagnoses to be made or excluded.
Management of ABC

Blood glucose ≤2.6mmol/L

Insert cannula
Hypo bloods (see list)
Send lab glucose to confirm
Pad to collect urine

DO NOT DELAY CORRECTION OF HYPOGLYCAEMIA WHILST AWAITING CONFORMATION OF LABORATORY GLUCOSE

Patient conscious / able to take oral intake with no vomiting / drowsiness
(If unwell or not tolerating/able to give oral dextrose – you must gain IV access)

Yes
Oral feed of carbohydrates suitable for age of child (see text above)

Repeat blood glucose 20-30 mins after feed; Still hypoglycaemic?

Yes
No
Admit for observation, continuing feeds & monitoring of blood glucose (initially every 30 mins until stable)

No
2ml/kg 10% dextrose followed by infusion rate at 5ml/kg/hr

Repeat blood glucose at 5 minutes; Still hypoglycaemic?

Yes
No
Inform consultant
Consider IV hydrocortisone (4mg/kg, max 100mg) if severe/resistant hypoglycaemia or adrenal insufficiency suspected.
Do not give glucagon unless venous access is lost (0.5mg if <25kg, 1mg if >25kg)

No
Repeat 10% dextrose bolus: 2ml/Kg 10% Still hypoglycaemic?

Yes
No
Continue IV 10% dextrose infusion at rates 3-5ml/kg/hr and adjust infusion rate accordingly with regular blood glucose measurement. Admit & close observations.
In all age groups, apart from the immediate neonatal period, (<24 hrs) hypoglycaemia is defined as a blood glucose of less than/equal to 2.6mmol/L. Persistent symptomatic hypoglycaemia requires urgent investigation. If the correct investigations are performed at the time of the child being hypoglycaemic, potential important diagnoses can be made and avoidance of the need for further diagnostic fasts.

Many children will present with hypoglycaemia secondary to an intercurrent illness, for example gastroenteritis, tonsillitis. These children may only present once. When discharging them, a follow up appointment should be made for clinic to ensure investigations are consistent with this. Advice should be given to ensure fasting does not happen, (i.e. use of dioralyte / fruit juice / lucozade if unwell & refusing diet) rather than plain water.

Patients should be informed of the symptoms of hypoglycaemia and to present to ED in an urgent manner, informing the staff that their child has experienced low blood sugar previously (as some children may present recurrently). It is not practicable to produce a parent information leaflet on this subject, as all patients can present so differently, with a potential large range of underlying causes.

If recurrently presenting, or other significant concern, discuss with general consultant and then consider speaking with the endocrine team, metabolic team for further advice and follow up.

**Endocrine team:**
- Endocrinology SpR,
- Consultants: Professor John Gregory, Dr Justin Warner (switchboard / endocrine secretaries should have rota of who is providing cover in hours & out of hours)

**Metabolic team:**
- Consultant (and Medical Director) Dr Graham Shortland: liase with secretary Sue Crownshaw ext 43275
- Metabolic Dietician: Kath Singleton: via switchboard
- Metabolic Nurse Practitioner: Andrew Dobson (mainly based in CIU)
Examples of Causes of Hypoglycaemia

Inadequate glucose production

- Insufficient glycogen (usually transient in the neonate or secondary to IUGR)
- Glycogen storage disease
- Accelerated starvation
- Enzyme deficiencies e.g. galactosaemia, fructose intolerance and other metabolic defects
- Hormone deficiencies e.g. ACTH, glucocorticoids, glucagon, catecholamines
- Liver disease, e.g hepatitis, Reye’s syndrome
- Alcohol, salicylates

Excessive glucose consumption

- Infant of a diabetic mother
- Beckwith Weidemann Syndrome
- Persistent Hyperinsulinaemic Hypoglycaemia of Infancy
- Insulinoma
- Factitious or excessive insulin administration
- Perinatal asphyxia

References

1) Child Health UHW: current guidelines ‘Investigation of a child presenting with hypoglycaemia’
2) University Hospitals Bristol NHS Foundation Trust: Hypoglycaemia Guideline: Investigation and management of acute presentation
3) Children’s Hospital Melbourne: Hypoglycaemia guideline
4) Nottingham University Hospitals NHS Trust: Paediatric clinical guideline, endocrine, hypoglycaemia