Newborn hypoglycaemia

Clinical Guideline Presentation V5

45 minutes
Towards CPD Hours
References:
Queensland Clinical Guideline: Newborn hypoglycaemia is the primary reference for this package.

Recommended citation:

Disclaimer:
This presentation is an implementation tool and should be used in conjunction with the published guideline. This information does not supersede or replace the guideline. Consult the guideline for further information and references.

Feedback and contact details:

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Learning outcomes

At the end of this session about Newborn Hypoglycaemia the participant will be able to outline:

• Risk factors
• How it is defined
• Preventative care for the baby at risk
• Management of hypoglycaemia
• Discharge planning
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>BGL</td>
<td>Blood glucose level</td>
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<tr>
<td>EBM</td>
<td>Expressed breast milk</td>
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<tr>
<td>FGR</td>
<td>Fetal growth restriction</td>
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<tr>
<td>LGA</td>
<td>Large for gestational age</td>
</tr>
<tr>
<td>SGA</td>
<td>Small for gestational age</td>
</tr>
<tr>
<td>&lt;</td>
<td>Less than</td>
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<tr>
<td>&gt;</td>
<td>Greater than</td>
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<tr>
<td>≥</td>
<td>Greater than or equal to</td>
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</tbody>
</table>
Physiology

Fetal life:
• Main sources of energy—glucose, lactate and amino acids
• Energy stored (glycogen & adipose tissue)

After birth:
• Insulin levels fall, catecholamines & pancreatic glucagon released for gluconeogenesis and glycogenolysis
• Adaptation to fast and feed cycle promotes oxidative fat metabolism
Physiology

Glycogenolysis

• Insulin levels fall and epinephrine and glucagon levels rise
• Stored glucose breaks down

Gluconeogenesis

• Glucose synthesised from non-carbohydrate sources during first 8–12 hours of life
Hypoglycaemia defined

- BGL < 2.6 mmol/L
- Severe if BGL < 1.5 mmol/L or unrecordable
- Symptomatic baby

Clinical hypoglycaemia occurs when the BGL is low enough to cause signs of impaired brain function—influenced by the extent and duration of low BGL.
Causes

- Increased levels of insulin
- Increased glucose utilisation
- Inadequate glucose supply
- Inadequate body stores (glycogen, fat)
- Decreased counter-regulatory hormones
- Disorders of glycogenolysis
- Disorders of gluconeogenesis
Maternal risk factors

- **Medications**—beta blockers, insulin, oral hypoglycaemics, betamethasone
- **Diabetes**—poorly controlled of any type
- **Family history**—genetic hypoglycaemia or congenital hyperinsulinaemia
- **Intrapartum glucose**—> 20 g/hour IV
- **Maternal conditions**—pre-eclampsia, eclampsia, hypertension
Baby risk factors

- Increased glucose requirements, e.g. hypothermic or cold stress, birth asphyxia, infection, congenital heart disease, respiratory disease
- FGR; preterm; LGA; SGA
- Delayed/inadequate feeding
- IV therapy–abrupt cessation or infiltration
- Polycythaemia/hyperviscosity
- Seizures
- Increased levels of insulin
- Congenital anomalies
- Inborn errors of metabolism
- Hypothyroidism
- Meconium aspiration syndrome
- Endocrine disorders, e.g. congenital adrenal hyperplasia
Screening and assessment

Physical assessment:
• Identify if FGR, SGA, LGA
• Physical assessment for associated signs

Screening:
• Before second feed, no more than 3 hours of age
• Before third feed, no more than 6 hours of age
• If normal every 3–6 hours
BGL screening

Validate with diagnostic test if,
• BGL < 2.6 mmol/L
• Borderline result in baby with risk factors
• Symptomatic hypoglycaemia

Use glucometer suitable for neonates

Use point of care analyser, blood gas analyser or laboratory specimen
Prevention

• Keep baby warm
• Skin-to-skin
• Breast feed within 1 hour of birth
• If maternal choice give baby formula
  ◦ 30–40 mL/kg/day (no or low risk baby)
  ◦ 60–75 mL/kg/day (at risk baby)
• If enteral feeding not possible or contra-indicated
  ◦ IV glucose 10% at 60 mL/kg/day
Clinical signs/symptomatic hypoglycaemia

Neurogenic
• Jitteriness/persistent tremor
• Irregular or rapid breathing
• Sweating, irritability, pallor

Neuroglycopenic
• Poor feeding
• Abnormal cry—weak/high pitched

Other
• Apnoea, bradycardia, cyanosis, tachycardia
Well, hypoglycaemic baby

If BGL 1.5–2.5 mmol/L and Baby is ≥ 35 weeks gestation and feeding well

Give glucose gel 40% 0.5 mL/kg and breastfeed baby
Repeat BGL 30 minutes after glucose gel given
**Poor feeding and BGL 1.5–2.5 mmol/L**

**If >2 mmol/L:**
- Glucose gel and
- Feed baby—7.5 mL/kg/feed day 1
- Continue monitoring and feeding baby

**If ≤2 mmol/L:**
- Admit to neonatal unit
- IV glucose
- Continue breast feeding baby if able
BGL < 1.5 mmol/L or baby symptomatic

- **Urgent** treatment—admit to neonatal unit
- Confirm screening BGL with diagnostic sample
- Diagnostic blood and urine samples
- IV glucose urgently
- IM/subcut glucagon if IV glucose delayed more than 10 minutes
- Continue feeds if able—include any formula in total volume
Glucose gel

- Effective adjunct to oral feeding
- Give 0.5 mL/kg (200 mg/kg) of 40% glucose gel
- Recheck BGL after 30 minutes
- Repeat dose if required

To administer:
- Dry baby’s buccal mucosa with gauze
- Rub gel into buccal mucosa
- Breast feed baby immediately

Glucose gel for neonatal use is supplied as Glucose® 15 g glucose in 37.5 g tube
Glucose gel

• Criteria to escalate:
  ◦ BGL remains less than 2.6 mmol/L
  ◦ Baby unwell or feeding poorly

• Admit to neonatal unit:
  ◦ BGL less than 2.6. mmol/L after 2 doses of glucose gel and EBM or formula feed
  ◦ BGL less than 1.5 mmol/L at any time
  ◦ Baby becomes unwell or feeds poorly
**Diagnostic samples**

**Blood**
- Insulin, cortisol, growth hormone, adrenocorticotropic hormone
- Ketones (beta hydroxybutyric acid)
- Free fatty acids
- Acyl-carnitine profile
- Blood gas, electrolytes, glucose, haemoglobin, haematocrit, lactate

**Urine**
- Metabolic screen
  - First sample after hypoglycaemic episode
  - Treatment may be started

*Take blood samples immediately before treatment during hypoglycaemic episode*
Indicated if BGL < 1.5 mmol/L (or unrecordable)
Use UVC/PICC if greater than 12% glucose

- Increase volume, then concentration for immediate effect
- Commence glucose 10% at 60 mLs/kg (4.2 mg/kg/minute)
- Give bolus 1–2 mL/kg and increase infusion rate
Weaning glucose infusion

General principles:
• Reduce glucose infusion to 8 mg/kg/minute
• Wean glucose infusion and increase feeds
• Wean glucagon (if used)
• Wean hydrocortisone (if used)
Medications

**Indication**
BGL not normalised after 40% glucose gel or IV glucose

**Short term**
- Glucagon—effective for babies of diabetic mother or other hyperinsulinaemic condition
- Hydrocortisone—increases glucogenesis

**Long term**
- Diazoxide (with hydrochlorothiazide)—for persistent hypoglycaemia
- Octreotide—inhibits insulin
Discharge

Criteria
Pre-prandial BGL for 3 feed-fast cycles
- Baby < 48 hours of age: > 2.6 mmol/L
- Baby >48 hours of age: > 4 mmol/L

Educate parents about
- Causes, risks, potential sequelae, management
- Escalation signs and plans

Provide parent information brochure

Follow up
- GP and child health nurse
- If severe, symptomatic, recurrent, atypical—specialist follow up

Reduce risk in next pregnancies
- Maternal lifestyle
- Genetic counselling
- Diabetes management

Consider 6 hour fast test
Six hour fast test

• Identifies baby requiring additional investigations or management

• Indications
  ◦ Known risk of genetic/persistent form of hypoglycaemia
  ◦ Baby without hypoglycaemic disorder risk

Check BGL at 4, 5 and 6 hours post feed (skip one feed)—omit further feeds during test

• If BGL < 3 mmol/L or baby is symptomatic:
  ◦ Perform investigations and then feed baby
• If BGL ≥ 3 mmol/L:
  ◦ Finish test and feed baby

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