Newborn hypoglycaemia

Clinical Guideline Presentation

45 minutes

Towards CPD Hours

Clinical Excellence Queensland

Queensland Government

References:

Queensland Clinical Guideline: Newborn hypoglycaemia is the primary reference for this package.

Recommended citation:

Queensland Clinical Guidelines. Newborn hypoglycaemia clinical guideline education presentation E19.8-1-V4-R24. Queensland Health. 2019.

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.

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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

BGL	Blood glucose level
EBM	Expressed breast milk
FGR	Fetal growth restriction
LGA	Large for gestational age
SGA	Small for gestational age
<	Less than
>	Greater than
≥	Greater than or equal to

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:

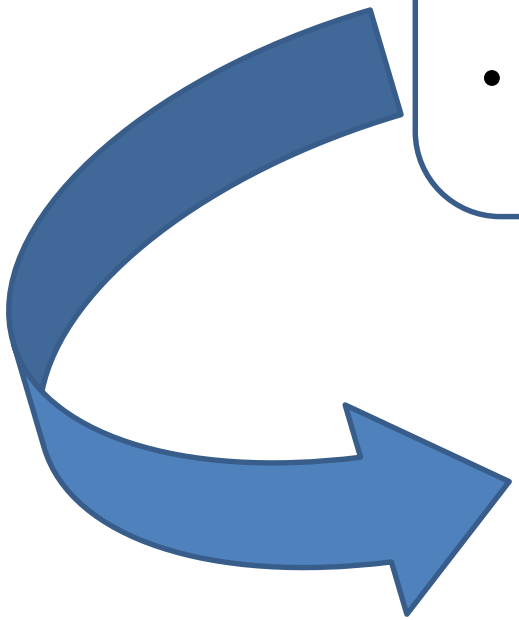
- Before second feed, no more than 3 hours of age
- Before third feed, no more than 6 hours of age
- If normal every 3–6 hours

BGL screening

Use glucometer suitable for neonates

Validate with diagnostic test if,

- BGL < 2.6 mmol/L
- Borderline result in baby with risk factors
- Symptomatic hypoglycaemia



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–7.5mL/kg/24 hours on 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 Gluctose® 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, adrenocorticotrophic hormone
- Ketones (beta hydroxybutyric acid)
- Free fatty acids
- Acyl-carnitine profile
- Blood gas, electrolytes, glucose, haemoglobin, haematocrit, lactate

Take blood samples immediately **before** treatment **during** hypoglycaemic episode

Urine

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

IV therapy

- 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

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

Consider 6 hour fast test

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

Provide parent information brochure

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

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