

# 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:**

Queensland Clinical Guidelines. Newborn hypoglycaemia clinical guideline education presentation E19.8-1-V5-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

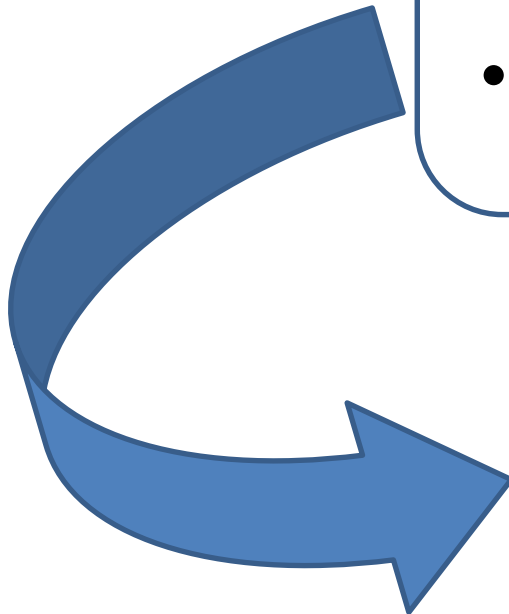
# BGL screening

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

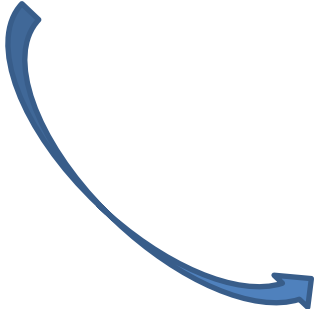
- Poor feeding
- Abnormal cry—weak/high pitched

## Other

- Apnoea, bradycardia, cyanosis, tachycardia

# Well, hypoglycaemic baby

If BGL 1.5–2.5 mmol/L and  
Baby is  $\geq 35$  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  $\leq 2$  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<sup>®</sup> 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

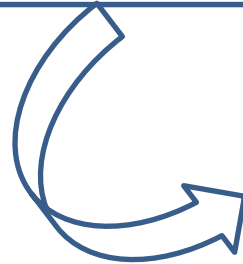
Take blood samples immediately **before** treatment **during** hypoglycaemic episode

## 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 sequelae, 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

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