CLINICAL PRACTICE GUIDELINE
KEMH Postnatal Wards

Hypoglycaemia

This document should be read in conjunction with the Disclaimer

Aim

- To provide early recognition and management of hypoglycaemia in infants at risk.
- Establish criteria for admission to SCN for NGT feeds, IV dextrose or for further investigation.
- Establish criteria for cessation of blood sugar monitoring.

Asymptomatic hypoglycaemia is a common transient problem in most neonates. Symptomatic hypoglycaemia is an emergency and requires intravenous treatment.

Symptoms include:

- CNS excitation: irritability, jitteriness, seizures.
- CNS depression: hypotonia, lethargy, poor feeding, apnoeas.
- Non-specific: temperature instability, sweating, tachycardia.

The foetus under normal conditions derives all its glucose from the mother. At birth all infants must initiate glucose production and absorption. Most are able to mobilise glycogen, initiate gluconeogenesis and produce glucose at a rate of 4-6mg/kg/min. This is usually adequate to maintain euglycaemia - normal blood glucose.

The definition used at KEMH and PMH for hypoglycaemia is a blood glucose of <2.6mmol/L.

Causes/Risk Factors for Hypoglycaemia

Inadequate supply or reduced glycogen stores	Increased utilisation	Hormone/metabolism imbalance
Prematurity	Infection	Infant of diabetic mother
Small for gestational age	RDS	Persistent hyperinsulinaemic hypoglycaemia of infancy
Poor feeding	Hypothermia	Inborn errors of metabolism
Tissued IV	Perinatal asphyxia	Syndrome: Beckwith-Wiedemann
	Hyperthermia	Pancreatic tumor
	Erythroblastosis foetalis	Congenital adrenal hyperplasia
		Hypopituitarism

The cause/risk factors for hypoglycaemia can be divided into:
Persistent or recurrent hypoglycaemia (≥ 2 episodes of hypoglycaemia) warrants further investigation. It is commonly caused by hyperinsulinism secondary to maternal diabetes however other differentials should be considered such as CAH, syndromes and inborn errors of metabolism.

Infants at Risk of Hypoglycaemia

It is important to explain to the parents of at-risk infants that their infant is more likely than others to develop hypoglycaemia, and that their infant will need close monitoring of blood glucose. Refer to Quick Reference Guide below.

Infants at risk of hypoglycaemia that require early energy provision and BGL/PGL monitoring:

- Infants of mother's with diabetes (insulin-dependent, type 2 DM or GDM).
- Infants that are small for gestational age (below the 10th percentile).
- Preterm infants (less the 37 weeks gestation).
- Infants of mothers that have received antenatal corticosteroids > 34 weeks gestation.

Early Energy Provision - Within 1-2 Hours of Birth

- Offer early skin to skin under warm blankets.
- Encourage early first breast feed followed by 3 hourly feeds/more frequent if demanding.
- If poor breast feeding consider supplemented enteral feeding 3 hourly.
  - Start at 60-80mL/kg/day or 12.5mL/kg/feed if not contra-indicated.
- If enteral feeding is not possible then admit to NICU and give 10% Glucose.
  - Start at 60-80mL/kg/day (providing 4.9 mg/kg/min of glucose).

Glucose Monitoring of at Risk Infants
• Whole blood glucose (blood gas analyser) or plasma glucose (biochemistry lab) should be performed. Reagent strips should not be used for PGL monitoring for infants. • Please follow appropriate postnatal ward / SCN flowchart. • For at risk infants, first sample done pre-second feed (3-4 hours of age). • If infant feeding well and PGL ≥ 2.6mmol then repeat PGLs 6 hourly (pre-feed) - if 2 consecutive PGLs are ≥ 2.6mmol/L then stop regular monitoring and test only if infant becomes symptomatic.

Investigation of Neonatal Hypoglycaemia - "Hypoglycaemia Screen"

If hypoglycaemia is persistent/recurrent (≥ 2 episodes), resistant to treatment, or GIR is > 10mg/kg/min then investigate further (see below for hypoglycaemia screen).

If the decision is made to investigate a neonate for unexplained or persistent hypoglycaemia then a "hypoglycaemia screen" should be performed.

Hypoglycaemia Screen
The blood samples **MUST** be collected at the time of hypoglycaemia, wherever safe prior to commencing supplementation:
• 1 mL of clotted blood and 1 mL of heparinised blood (2 small red top and 2 small green top tubes). Request insulin, cortisol, growth hormone, glucose, ketones or β-hydroxybutyrate. • Blood gas analysis: lactate. • The NEXT urine passed is important (aim for 5 mL urine). Request ketones, amino acids and organic acids.
Contact the Biochemical Genetics Unit for any queries regarding these investigations.

Management of Hypoglycaemia

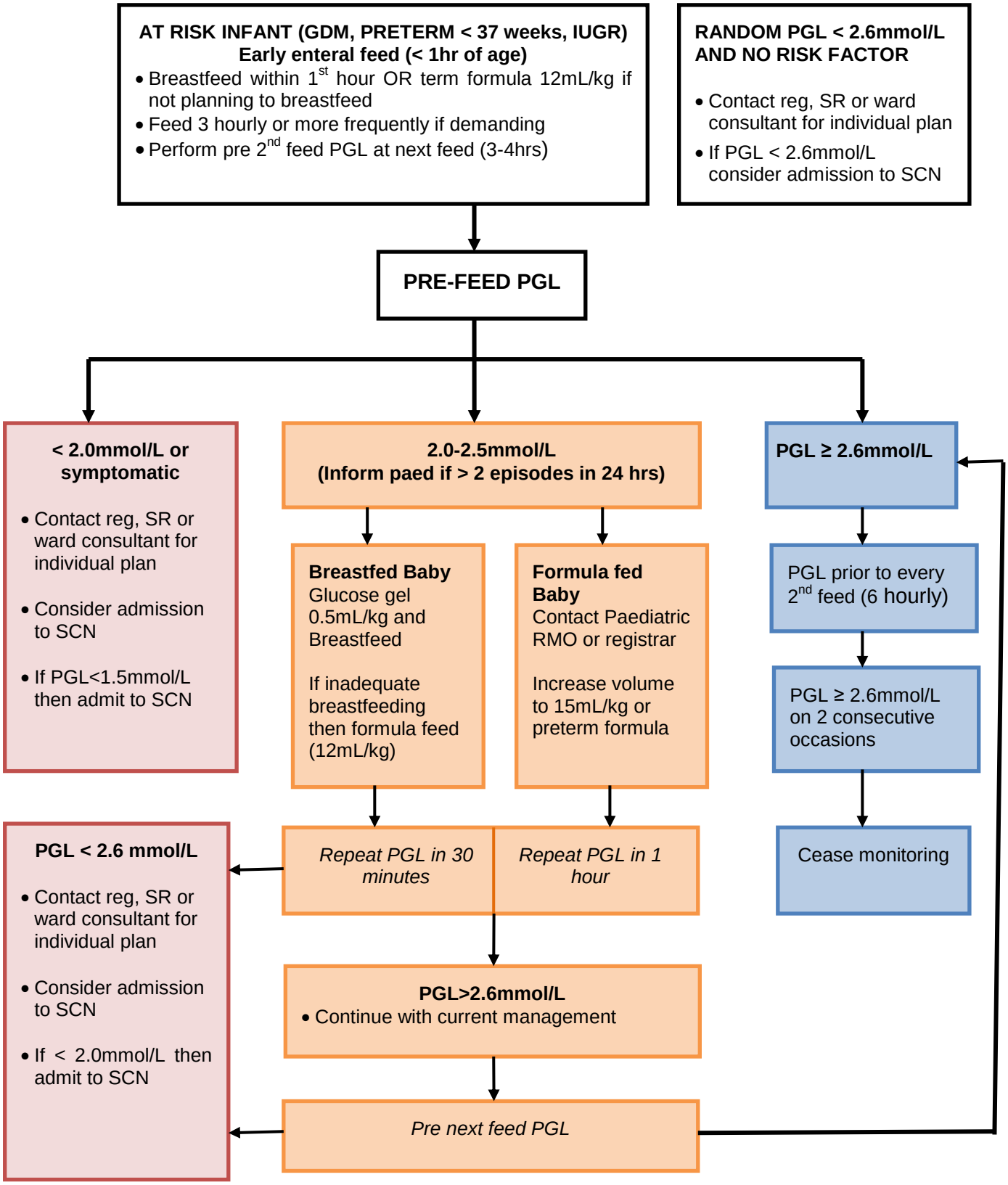
Asymptomatic Infants with PGL 1.5-2.5mmol/L

Needs paediatric registrar review - consider "hypoglycaemia screen" and need for admission to SCN.
Enterally Feeding
• Start enteral feeding at 60-80mL/kg/day if no contra-indications.
• If persistent or recurrent then increase feed volume to 15mL/kg/feed.
  ◦ Provides GIR of 7 mg/kg/min; total fluids 120mL/kg/day.
  ◦ Consider more regular feeds (2 hourly).
  ◦ If no contraindications then feeds can be fortified.
• Admit to NICU if:
  ◦ PGL remains between 1.5-2.5mmol/L despite the increased feeds to 15mL/kg/feed.
  ◦ Infant is symptomatic (lethargic with inadequate feeds, seizure).

Asymptomatic Infants with PGL < 1.5mmol/L
Admit to NICU immediately for IV supplementation. • Take "hypoglycaemia screen" (above) if it does not delay treatment significantly.
Symptomatic Infants – Seizures, Reduced Consciousness
Admit to NICU for urgent IV supplementation • Take hypoglycaemia screen if it does not delay treatment significantly.

Persistent Hyperinsulinaemic Hypoglycaemia of Infancy (PHHI)

PHHI is commonly seen in infants born to a mother with gestational diabetes, however can occur in mother's with a normal glucose tolerance test. It is diagnosed by finding an elevated insulin level during a period of hypoglycaemia. Infants with PHHI may require a significantly higher GIR of up to 10-12mg/kg/min.



Pink boxes: infants require an individualised plan as they have moderate to severe hypoglycaemia or they have not responded well to intervention (glucose gel, increased calories).
Orange boxes: intervention is divided into breastfed babies and formula fed babies.

Note: if more than 2 pre-feed PGLs are < 2.6mmol/L in a 24 hour period, please inform paediatric team.

References

1. WHO, 1997 - Hypoglycaemia of the Newborn Review of the literature. WHO Geneva.
2. Akerblom H.K. Savilahti E. Vaarala O1996 Cows milk protein and insulin-dependent diabetes mellitus. Scandinav Journ of Nutrition
3. Hawdon J M. Aynsley-Green A. (1999) Disorders of blood glucose homeostasis in the neonate in Textbook of Neonatology 3rd edition p947.
4. Vogel A. Hutchison BL. Mitchell EA. 1999. Factors associated with the duration of breastfeeding. Acta Paediactrica. 88:12: 1320-6.
5. Arthur, P.G., Kent, J. and Hartmann, P.E. (1994). Metabolites of lactose synthesis in milk from diabetic and non diabetic women during lactogenesis II. Journal of Paediatric Gastroenterology and Nutrition. 19 pp 100-108.
6. http://www.cps.ca/english/statements/FN/fn04-01.htm
7. Harris DL, Weston PJ, Battin MR, Harding JE. The sugar babies study, A RCT of dextrose gel for treatment of neonatal hypoglycemia; J of Paed and child health 47, (Supplement 1) 2011, 8-59

Related WNHS policies, procedures and guidelines

WNHS Neonatology Clinical Guidelines: Hypoglycaemia

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