GUIDELINE

Hypoglycaemia

Scope (Staff):	Midwifery, Nursing and Medical Staff
Scope (Area):	KEMH Postnatal Wards

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this 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

Background

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, hypothermia, sweating, tachycardia.

The fetus 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 PCH for hypoglycaemia is a blood glucose of < 2.6mmol/L.

Causes / Risk Factors for Hypoglycemia

Inadequate supply or reduced glycogen stores	Increased utilisation	Hormone/metabolism imbalance
• Prematurity • Small for gestational age • Poor feeding • Peripheral IV tissued	• Infection • Respiratory Distress Syndrome • Hypothermia • Perinatal Asphyxia • Hyperthermia • Erythroblastosis Foetalis	• Infant of a diabetic mother • Persistent hyperinsulinaemic hypoglycaemia of infancy • Inborn errors of metabolism • Syndrome: Beckwith-Wiedemann • Pancreatic tumor • Congenital adrenal hyperplasia • Hypopituitarism

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 Congenital Adrenal Hyperplasia, 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 mothers with diabetes (insulin-dependent, type 2 DM or GDM).
- Infants small for gestational age (<10th centile) refer to Appendix 1
- Preterm infants (<37 weeks gestation)
- Infants with birthweight <2.5kg
- Infants large for gestational age (>97th centile) refer to Appendix 1
- Infants of mothers who received antenatal corticosteroids > 34 wks gestation.
- Infants of mothers who received beta blockers in 3rd trimester.

Early Energy Provision - Within 1 Hour 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 supplemental enteral feeding 3 hourly with term formula.
    - Start at 60mL/kg/day (7.5mL/kg/feed) if not contra-indicated.
- If enteral feeding is not possible then admit to NICU and commence 10% Glucose via IV.
    - Start at 60mL/kg/day (providing 4.2 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. • For at risk infants, first sample taken pre-second feed (3-4 hours of age). • If infant feeding well and PGL ≥ 2.6mmol then repeat PGL 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 glucose delivery rate is > 10mg/kg/min then investigate further with a hypoglycaemia screen.

Hypoglycaemia Screen
The critical blood samples **MUST** be collected at the time of hypoglycaemia, wherever safe, prior to commencing supplementation. **DO NOT** administer sucrose before heel stab/ venepuncture.

• 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

Paediatric RMO/ registrar review required - consider “hypoglycaemia screen” and need for admission to SCN.
 	
Enteral Feeding
• Start enteral feeding at 60-80mL/kg/day if no contra-indications.
• If there is insufficient breast milk and parents decline formula, escalate rapidly to paediatric medical staff to avoid delays in treatment.
• If persistent or recurrent hypoglycaemia, then increase feed volume to 12.5mL/kg/feed (100ml/kg/day).
• Consider more regular feeds (2 hourly).
• Admit to SCN if:
  ○ PGL remains between 1.5-2.5mmol/L despite the increased feeds.
  ○ Infant is symptomatic (lethargic with inadequate feeds, seizure).

Asymptomatic Infants with PGL < 1.5mmol/L
Admit to SCN immediately for IV supplementation. If IV access is difficult, consider IM Glucagon while siting the IV. • Perform “hypoglycaemia screen” if it does not delay treatment significantly.
Symptomatic Infants – Seizures, Reduced Consciousness
Emergency Management – access and use hypoglycaemia kit in emergency trolley. **Admit to SCN for urgent IV supplementation.** If IV access is difficult, consider IM Glucagon while siting the IV. • Perform 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 mothers 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 glucose delivery rate of up to 10-12mg/kg/min.

AT – RISK INFANT

GDM, PRETERM < 37 weeks, SGA, LGA, BW<2.5kg, antenatal steroids >34 weeks, maternal beta blockers

Early enteral feed (within 1hr of age)

- Breastfeed within 1st hour OR term formula 7.5mL/kg if not planning to breastfeed
- Feed 3 hourly or more frequently if demanding
- Perform pre 2nd feed PGL at next feed (3-4hrs)

RANDOM PGL < 2.6mmol/L AND NO RISK FACTOR

- Contact RMO, reg, SR or ward consultant for individual plan

*Seizures/ reduced consciousness: access & use hypoglycaemia kit in emergency trolley.

** If there is insufficient breast milk & parents decline formula, escalate rapidly to paediatric medical staff to avoid delays with treatment.

PRE-FEED PGL

< 2.0mmol/L or symptomatic*

- Contact RMO, reg, SR or ward consultant for individual plan
- Consider admission to SCN
- If PGL<1.5mmol/L then admit to SCN

2.0-2.5mmol/L

Breastfed Baby
Glucose gel 0.5mL/kg and Breastfeed

If inadequate breastfeeding then give 7.5mL/kg EBM or term formula**

Formula fed Baby

Give 7.5mL/kg of term formula.

PGL ≥ 2.6mmol/L

PGL prior to every 2nd feed (6 hourly)

PGL ≥ 2.6mmol/L on 2 consecutive occasions

Cease monitoring

PGL < 2.6 mmol/L

- Contact RMO, reg, SR or consultant for individual plan
- Consider increasing feeds to 10-12.5mL/kg.
- If <2.0mmol/L, consider admission to SCN

Repeat PGL in 30 minutes

Repeat PGL in 1 hour

PGL ≥2.6mmol/L

- Continue with current management

Pre next feed PGL

Related CAHS internal policies, procedures and guidelines

Neonatology Clinical Guideline

Hypoglycaemia

Recognising and Responding to Clinical Deterioration

References and related external legislation, policies, and guidelines

1. WHO, 1997 - Hypoglycaemia of the Newborn Review of the literature. WHO Geneva.
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3. Hawdon J M. Aynsley-Green A. (1999) Disorders of blood glucose homeostasis in the neonate in Textbook of Neonatology 3rd edition p947.
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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

Useful resources

Hypoglycemia GP Referral Letter

This document can be made available in alternative formats on request.

Document Owner:	Neonatology		
Reviewer / Team:	Neonatology		
Date First Issued:	May 2016	Last Reviewed:	November 2021
Amendment Dates:	October 2022	Next Review Date:	23rd November 2024
Approved by:	Neonatology Coordinating Group	Date:	23rd November 2021
Endorsed by:	Neonatology Coordinating Group	Date:	
Standards Applicable:	NSQHS Standards:  Child Safe Standards: 1,10		

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Appendix 1: Centile Chart for Hypoglycaemia

Birth weight of term babies at the **10th centile**			Birth weight of term babies at the **97th centile**	
Male (weight)	Female (weight)	**Gestation (weeks)**	Male (weight)	Female (weight)
1900	1800	**35**	3280	3200
2170	2050	**36**	3550	3500
2400	2300	**37**	3800	3800
2600	2500	**38**	4020	4020
2800	2650	**39**	4280	4250
3000	2800	**40**	4500	4450
3200	3000	**41**	4750	4680
3400	3150	**42**	5020	4920