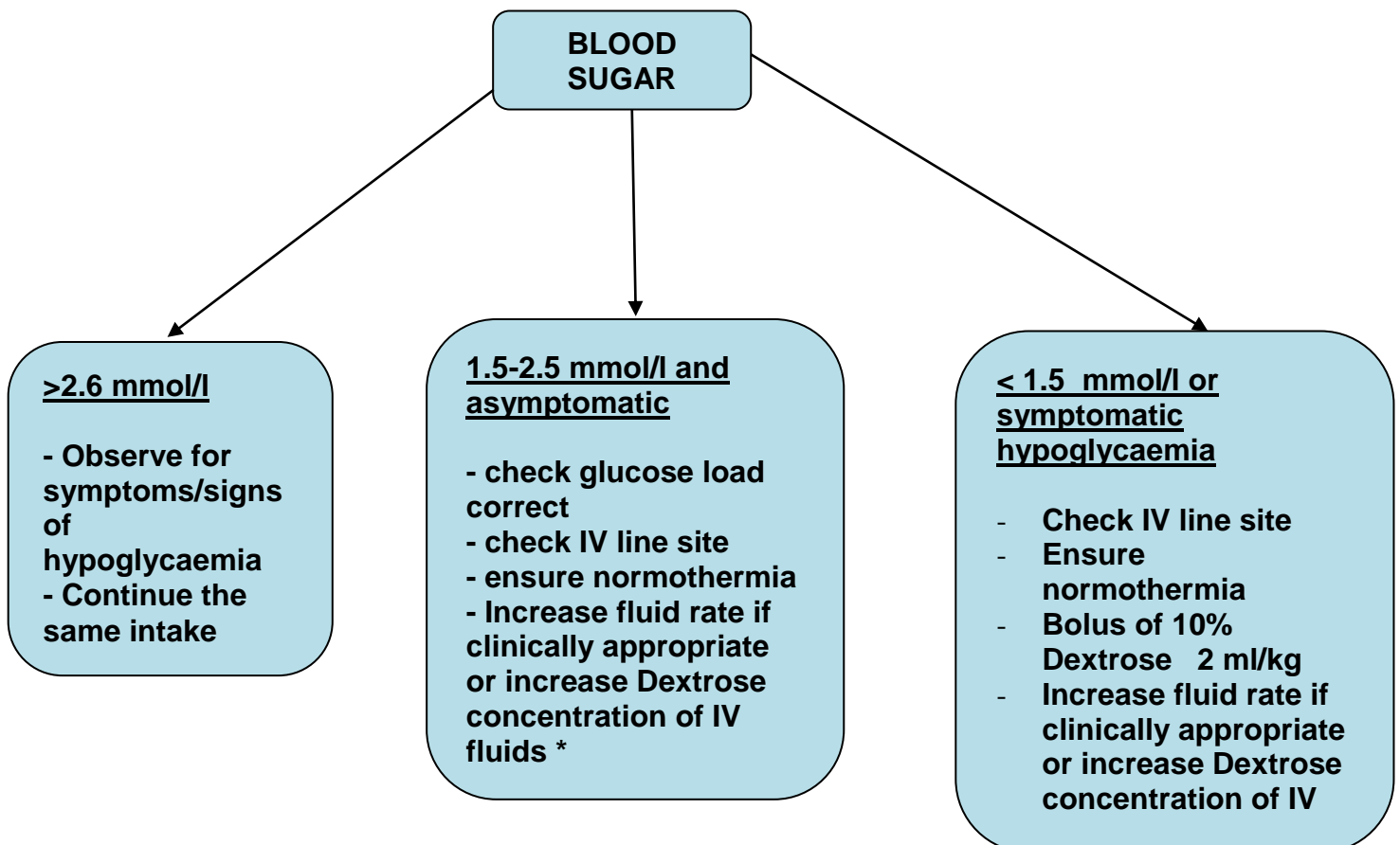


Title:	Hypoglycaemia		
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Hypoglycaemia

Most of the neonates requiring emergency transfer are very sick and at risk of hypoglycaemia. Neonates prepared for emergency transfer will remain NBM on IV fluids and their blood sugar level needs to be monitored closely.

Management of neonatal hypoglycaemia Algorithm



***Note**

- The maximum concentration of IV Dextrose that can be administered peripherally is **12.5%**.
- For higher concentration only central access (UVC, long line) is appropriate

Risk factors for neonatal hypoglycaemia

There are many underlying risk factors that increase the risk of hypoglycaemia including:

A: Maternal factors:

- Maternal diabetes or impaired glucose tolerance
- Maternal drug treatment such as terbutaline, ritodrine, β blockers

B: Neonatal factors:

- Gestation <37/40
- Birth weight <2.5kg, or <2nd centile for weight (and babies with intrauterine growth restriction who are of 'normal' birthweight but have a clinically wasted appearance)
- Large for gestational age infants
- Perinatal hypoxia ischaemia
- Infection
- RDS
- Polycythaemia
- Hypothermia

C: Underlying pathology:

- Neonatal hyperinsulinism – transient or prolonged
- Endocrine disorders
- Inborn errors of metabolism

Definition of hypoglycaemia

- Due to the absence of conclusive data as to what levels of blood glucose can be associated with effects on long term neurological outcome¹ a margin of safety should be applied and a higher therapeutic goal aimed for
 - Hypoglycaemia is defined as a blood glucose level of <2.6mmol/l
 - However consider maintaining a blood glucose level above 3mmol/l in higher risk babies

Signs and symptoms suggestive of hypoglycaemia

- Often asymptomatic
- Jitteriness
- Irritability
- Tremor
- Poor feeding
- High pitch cry
- Seizures
- Hypotonia
- lethargy
- Apnoea

Note

- The absence of symptoms at low glucose level does not rule out CNS injury.
- There is no single level below which brain injury definitely occurs.
- There are suggested operational thresholds of the blood sugar level commonly used (following Cornblath et al, Paediatrics 2000) as an indication for action (see algorithm).

Adequate glucose intake for a neonate

- Normally for a term baby this is 4-6mg/kg/min and for preterm babies 6-8mg/kg/min
- See Neomate app for more information on glucose delivery management advice
- Once a baby requires **>10mg/kg/min** glucose a pathological cause becomes more likely (*see appendix 1 for causes of persistent hypoglycaemia and the investigations that should be done as part of a hypoglycaemia screen*)

Chart for conversion of rate of glucose infusion from mL/kg/24 hours to mg/kg/min depending on strength of dextrose solution

Infusion rate mL/kg/24h	dextrose strength				
	5%	10%	12.5%	15%	20%
	glucose intake : mg/kg/min				
40	1.4	2.8	3.5	4.2	5.5
60	2.0	4.2	5.2	6.2	8.3
80	2.8	5.6	6.9	8.3	11.2
90	3.1	6.3	7.8	9.4	12.5
100	2.8	6.9	8.7	10.4	13.9

- **Alternatively:**

$$\text{Glucose requirement (mg/kg/min)} = \frac{\text{mL/h} \times \% \text{Dextrose}}{6 \times \text{weight (kg)}}$$

Causes of Hypoglycaemia to think about when transporting neonates

Hypoglycaemia may be caused by:

- inadequate iv glucose intake (check whether the glucose load you are giving is adequate – see list above and neomate)
- decreased glucose/fluid intake

- check prescription
- check for tissue cannula / misplaced UVC / blocked long line
- underlying metabolic or endocrine disorder (suspect if hypoglycaemia persistent even when glucose load adequate, congenital anomalies, raised lactate, history of consanguinity). In these instances blood test should be taken for a hypoglycaemic screen should be done (see appendix one)

How to make up concentrated Dextrose infusions

Concentration	volume of 10% Dextrose	volume of 50% Dextrose
12.5 %	46.5ml	3.5ml
15 %	44 ml	6 ml
20 %	37.5 ml	12.5 ml

References

1. Cornblath at all, Controversies regarding definition of neonatal hypoglycaemia: Suggested operational thresholds. Padiatrics , 2000
2. Georg Hansmann, Neonatal emergencies (handbook) 2009
3. G.Fox , N. Hoque, T. Watts, Oxford handbook of Neonatology, 2010
4. The Royal London Hospital NICU protocol: Management of hypoglycaemia.

Appendix 1

Causes of persistent hypoglycaemia

A) Too much insulin

- Secondary to maternal diabetes mellitus, intrauterine growth restriction and birth asphyxia
- Associated with syndromes, such as Beckwith-Wiedemann
- Congenital (multiple genetic mutations involved) hyperinsulinism

B) Too little anti insulin (such as cortisol, growth hormone)

- Congenital hypopituitarism
- Congenital adrenal hyperplasia

C) Inborn errors of metabolism, defective glucose production including

- Glycogen storage diseases
- Inborn errors of fatty acid oxidation

Investigations sent as part of a “Hypoglycaemia screen” in order to identify cause of hypoglycaemia

- These blood tests must only be carried out when the blood sugar is $<2.0\text{mmol/l}$ in order to allow accurate interpretation of the results
- Test blood for glucose (normally grey top but check with local hospital you are at) and ketones (normally yellow but again check with local hospital you are at) (will be absent or suppressed in hyperinsulinism)
- Insulin (plain-yellow) (should not be detectable in presence of hypoglycaemia)
- Growth hormone (lithium heparin-green)
- Cortisol (plain-yellow)
- Free fatty acids (plain-yellow), amino acids (lithium heparin-green)
- Urine for ketones, reducing substances, amino and organic acids
- Blood gas, lactate
 - Aim to send 2 yellow, 2 green and 1 grey bottle of blood to the lab (but again double check with lab at local hospital)
 - If unable to obtain enough blood at the time of blood glucose <2 prioritise insulin, growth hormone and cortisol