

## Intensive Care Nursery House Staff Manual

# Neonatal Hypoglycemia

**BACKGROUND and PATHOPHYSIOLOGY:** Glucose is the major energy source for fetus and neonate. The newborn brain depends upon glucose almost exclusively. Up to 90% of total glucose used is consumed by the brain. Alternate fuels (*e.g.*, ketones, lactate) are produced in very low quantities. The usual rate of glucose utilization is **4-8 mg/kg/min**. Glucose regulatory mechanisms are sluggish at birth. Thus, the infant is susceptible to hypoglycemia when glucose **demands are increased** or when exogenous or endogenous glucose **supply is limited**. **Severe or prolonged hypoglycemia may result in long term neurologic damage.**

**DEFINITION:** Hypoglycemia in the first few days after birth is defined as **blood glucose <40 mg/dL**. In preterm infants, **repeated** blood glucose levels **below 50 mg/dL** may be associated with neurodevelopmental delay.

**ETIOLOGY:** conditions associated with an increased risk for neonatal hypoglycemia include:

**1. Decreased substrate availability:**

- Intra-uterine growth retardation
- Inborn errors (*e.g.*, fructose intolerance)
- Prolonged fasting without IV glucose
- Glycogen storage disease
- Prematurity

**2. Hyperinsulinemia:**

- Infant of diabetic mother
- Erythroblastosis fetalis
- Beckwith-Wiedemann Syndrome
- "High" umbilical arterial catheter
- Islet cell hyperplasia
- Exchange transfusion
- Maternal  $\beta$ -mimetic tocolytic agents
- Abrupt cessation of IV glucose

**3. Other endocrine abnormalities:**

- Pan-hypopituitarism
- Adrenal insufficiency
- Hypothyroidism

**4. Increased glucose utilization:**

- Cold stress
- Sepsis
- Increased work of breathing
- Perinatal asphyxia

**5. Miscellaneous conditions:**

- Polycythemia
- CNS abnormalities
- Congenital heart disease

**SIGNS AND SYMPTOMS** of hypoglycemia are **nonspecific** and include: **jitteriness, irritability, lethargy, seizures, apnea, grunting and sweating** (uncommon). Hypoglycemic infants **may not always be symptomatic**. Therefore, routine glucose monitoring for **at-risk** infants is mandatory. Lack of symptoms does **not** guarantee absence of long term sequelae.

**DIAGNOSTIC WORKUP:** Specimens for measurement of glucose should be obtained from heelstick, venipuncture, or from an indwelling catheter that does not have glucose infusing in it.

**SCREENING OF AT RISK INFANTS:** Infants at risk for hypoglycemia should be screened by **measuring blood sugar by Glucometer at ages 1, 2, 4, 6, 9 and 12h**. Less frequent measurements are appropriate if blood glucose is stable. However continued surveillance and more frequent measurements may be needed until blood glucose is stable  $>40$  mg/dL or  $>50$  mg/dL in very preterm infants.

**MANAGEMENT OF HYPOGLYCEMIA:**

•**Glucometer reading  $>40$  mg/dL and infant is feeding normally:** follow usual nursery protocol.

•**Glucometer reading 20-40 mg/dL, infant is term and is able to feed:**

- Draw blood for stat blood glucose.
- Feed 5 mL/kg of D5W.
- Repeat blood glucose or Glucometer 20 min after feeding.

•**Glucometer reading: (a)  $<20$  mg/dL or  
(b)  $<40$  mg/dL and NPO or preterm or  
(c)  $<40$  mg/dL after feeding or  
(d)  $<40$  mg/dL and symptomatic**

- Draw blood for stat glucose measurement.
- Give IV bolus of 2-3 mL/kg of D10W.
- Begin continuous infusion of D10W at 4-6 mg/kg/min.
- If infant of diabetic mother, begin D10W at 8-10 mg/kg/min (100-125 cc/kg/d).
- Repeat blood glucose in 20 min and **pursue treatment until blood sugar  $>40$  mg/dL.**

•**For persistent hypoglycemia despite above measures:**

- Increase rate of glucose infusion stepwise in 2 mg/kg/min\* increments up to 12-15 mg/kg/min glucose. Use increased volume with caution in infants where volume overload is a concern. Maximal concentration of glucose in peripheral IV is D12.5.
- If infant requires IV dextrose concentrations  $>12.5\%$ , insert central venous catheter.

•**Do not use D25W or D50W IV or large IV volume boluses** as this creates rebound hypoglycemia in infants who are hyperinsulinemic. In addition, administration of D25W or D50W can cause dangerous increase in plasma osmolarity.

•**If hypoglycemia is not controlled with above measures:** Obtain Endocrine Consult to guide further diagnostic evaluation and management. While awaiting consult, send blood (while blood sugar is low) for glucose, plasma cortisol, growth hormone and insulin concentrations. Further management may include glucocorticoids, diazoxide, somatostatin or pancreatectomy.

•**Weaning IV dextrose infusion:** When blood glucose has been stable for 12-24 h, begin decreasing IV infusion by 1-2 mL/hr q3-4 hours if blood glucose remains  $\geq 60$  mg/dL.

\* To calculate rate of glucose administration, use either of the following formulas:

$$\frac{\% \text{ glucose} \times \text{mL/kg/d}}{144} = \text{glucose infusion rate (mg/kg/min)}$$

or

$$\frac{\% \text{ glucose} \times \text{mL/h}}{6 \times \text{body weight (kg)}} = \text{glucose infusion rate (mg/kg/min)}$$