NICU Glucose Monitoring and Management Guidelines

- Ongoing assessment and timely intervention should not be limited by these guidelines
- Do not delay treatment if delays in receiving confirmatory lab values
- Individualized assessment required

### Critical Labs
- Indication: infants with persistent and/or unexplained hypoglycaemia
- Must be sent STAT if glucose < 2.7 mmol/L
- Hypoglycaemia requires immediate attention and intervention
- Critical labs must be promptly ordered and drawn to prevent delays in implementing treatment
- Refer to critical lab order set for required labs

### Box A: Points to Remember
- Send stat glucose in capillary tube for faster results
- Notify lab of need for urgent results
- Delays in processing can result in falsely lower values (up to 1 mmol/hr)
- Excessive squeezing may introduce interstitial fluid which can alter results
- Hematocrit can affect glucose results:
  - High (>0.65) may produce falsely low result
  - Low (<0.25) may produce falsely high result
- Capillary samples drawn routinely for glucose monitoring are less accurate than venous or arterial samples
- Medications that can affect glucose include:
  - Diazoxide, octreotide, dexamethasone, insulin, glucagon, beta blockers (e.g. propranolol), hydrocortisone

### Box B: Treatment Options
1. IV bolus – an IV bolus of D10W 2ml/kg should be given
   Higher concentrations of dextrose are not recommended.
   Follow-up glucometer in 30 minutes.
2. The dextrose solution is generally increased by 30-50%.
   Follow-up glucometer in 2 hours
3. If there is no IV access, feeding is indicated.
   Then follow-up glucose in one hour
- A continuous IV solution of glucagon should be considered when the dextrose infusion rate exceeds 10 mg/kg/minute
- If there is ongoing hypoglycaemia, hyperinsulinism should be suspected and refer to the “NICU Management Algorithm for Neonatal Hyperinsulinism” for ongoing management
WHY DO WE DO CRITICAL BLOOD WORK?

WHEN DO WE DO CRITICAL BLOOD WORK?

For recurrent hypoglycemia (serum glucose < 2.7mmol/L) which may or may not be related to risk factors such as sepsis, asphyxia, prematurity, RDS, IVH, IUGR, SGA or IDM

WHAT CAUSES HYPOGLYCEMIA?

- Inadequate production of glucose (prematurity)
- Increased glucose utilization (RDS, asphyxia, sepsis etc.)
- Abnormal endocrine regulation of glucose metabolism
  
  e.g. decreased gluconeogenesis due to primary adrenal insufficiency, hypopituitarism, hypothyroidism, cortisol deficiency

WHAT TESTS DO WE DO TO DIAGNOSE THE UNDERLYING CAUSE OF HYPOGLYCEMIA?

CRITICAL BLOOD WORK:

- Electrolytes
- Glucose
- Lactate
- Capillary gas
- Insulin
- Growth hormone
- Cortisol
- Free fatty acids
- Beta hydroxybutyrate

  0.2 ml sent in capillary tube. Send on ice.

*3 ml sent in a red top container on ice

NOTE* if hematocrit is high you will need more blood
Glucose Monitoring

Preamble

- Glucose has an essential role in providing fuel to many tissues in the body, but is the major substrate of brain metabolism (Kenner et al, 1998)
- Carbohydrate metabolism is a complex system and homeostasis of glucose is of utmost importance
- Normal blood glucose levels are maintained by gluconeogenesis (Cornblath & Ichord, 2000)
- Neonatal hypoglycemia can result in neuronal injury (CPS, 2004), while hyperglycemia can result in increased serum osmolarity leading to cell injury and altered cell glucose transport (Avery et al, 1999)

Standards of Practice

1. All infants in the NICU will have a glucometer check with any blood sampling. If an infant is having multiple sets of bloodwork in a 24h period, it may not be necessary to do a glucometer check with each set of bloodwork unless clinically indicated (see algorithm).
2. Infants who exhibit symptoms of an altered serum glucose level will automatically be classified as high risk when making decisions about glucose monitoring
3. Symptoms of altered serum glucose levels include one or more of the following: jitteriness or tremors, apnea, episodes of cyanosis, convulsions, tachypnea, weak or high pitched cry, limpness or lethargy, difficulty feeding, eye rolling, episodes of sweating, sudden pallor, hypothermia, cardiac arrest
4. If a glucometer reading of ≤3 is obtained, a stat serum glucose will be sent to biochemistry

Calculation of Neonatal Glucose Requirements:

1. Need to know:
   - Neonate's wt in kg
   - IV infusion rate in ml/hr
   - % of dextrose being infused (concentration of glucose/mL)

2. Calculation:

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   \text{IV rate} \times \frac{\text{concentration of glucose/mL}}{\text{neonate's wt in kg}} = \text{mg of glucose/kg/hr}
   \]

   \[
   \text{mg of glucose/kg/hr} \div 60 \text{ minutes/hr} = \text{mg of glucose/kg/min}
   \]

   % of Dextrose concentration in IV fluids
   - D5W = 50 mg of glucose per mL
   - D10W = 100 mg of glucose per mL
   - D12.5W = 125 mg of glucose per mL

   Initial glucose infusion dose: 5-8 mg/kg/min
   Maximum dose: 11-16 mg/kg/min

References: