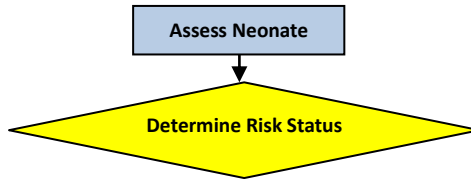


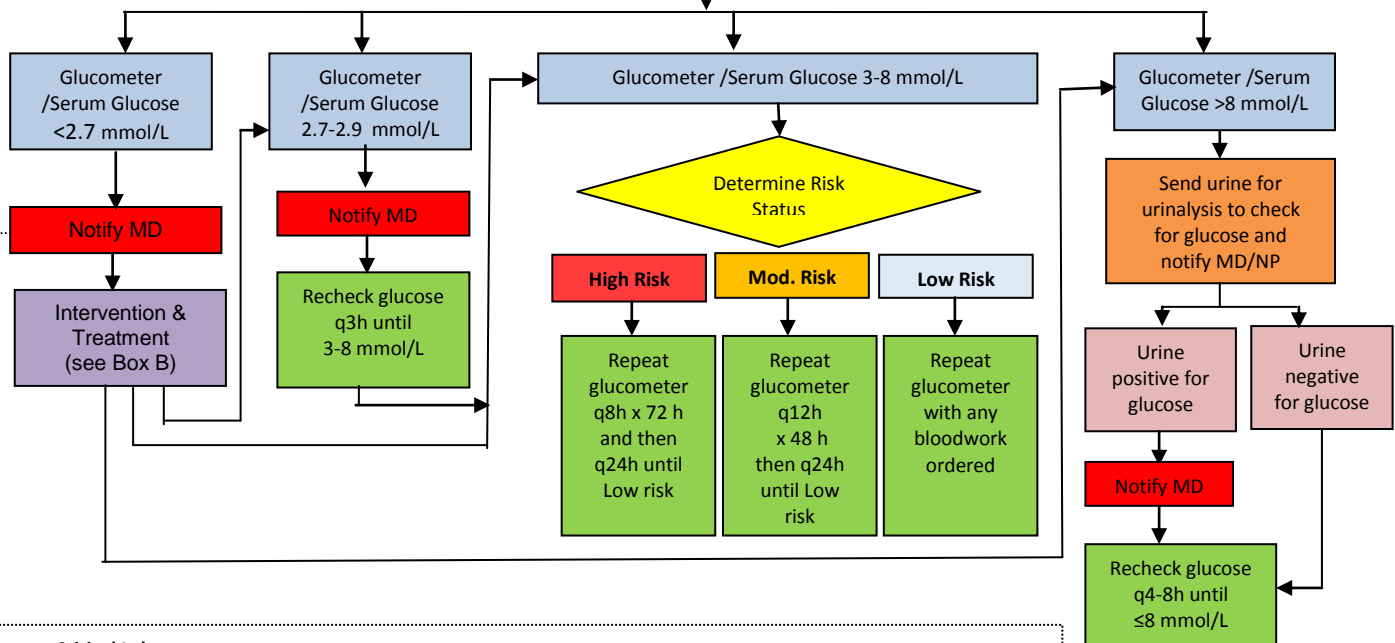
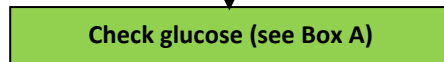
- Ongoing assessment and timely intervention should not be limited by these guidelines
- Do not delay treatment if delays in receiving confirmatory lab values
- Individualized assessment required

Hypoglycemia Symptoms:

- jitteriness or tremors
- difficulty feeding
- hypothermia
- apnea, episodes of cyanosis, tachypnea
- convulsions, eye rolling
- weak or high pitched cry, limpness or lethargy
- episodes of sweating, sudden pallor
- cardiac arrest



High Risk	Moderate Risk	Low Risk
<ul style="list-style-type: none"> • IDM, SGA • Previous glucose instability • Symptomatic hypoglycemia • Medications (see Box A) • ≤ 28 wks GA • Recurrent hypoglycemia • Leaking/lost IV • HIE 	<ul style="list-style-type: none"> • Sepsis • Post-operative • Increasing /decreasing PN/feeds • <24 hrs of age • New admission • Polycythemia • Decreased TFI 	<ul style="list-style-type: none"> • Full TPN • Full feeds



Critical Labs

- Indication-infants with persistent and/or unexplained hypoglycaemia
- Must be sent **STAT** if glucose <2.7 mmol/L
- **Hypoglycemia 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 effect 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 effect 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	}	0.2 ml sent in capillary tube. Send on ice.
Glucose		
Lactate		
Capillary gas		
Insulin	}	*3 ml sent in a red top container on ice
Growth hormone		
Cortisol		
Free fatty acids		
Beta hydroxybutyrate		

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 osmolality 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)

% 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

2. Calculation:

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

$$\frac{\text{mg of glucose/kg/hr}}{60 \text{ minutes/hr}} = \text{mg of glucose/kg/min}$$

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

References:

1. Canadian Paediatric Society. (2004). Screening guidelines for newborns at risk for low blood glucose. *Paediatrics and Child Health*, 9(10), 723-9.
2. Charsha, K.S., McKinley, P.S., Whitfield, J.M. (2003). Glucagon infusion for treatment of hypoglycaemia: efficacy and safety in sick, preterm infants. *Pediatrics*, 111, 220-1.
3. Cornblath, M., Hawdon, J.M., Williams, A.F., Aynsley-Green, A., Ward-Platt, M.P., Schwartz, R., and Kalhan, S.C. (2000). Controversies regarding definition of neonatal hypoglycaemia: suggested operational thresholds. *Pediatrics*, 105(5), 1141-5.
4. Cornblath, M. and Ichord, R. (2000). Hypoglycemia in the neonate. *Seminars in Perinatology*, 24(2), 136-49.
5. Cowett, R.M. and Loughhead, J.L. (2002). Neonatal glucose metabolism: differential diagnosis, evaluation, and treatment of hypoglycaemia. *Neonatal Network*, 21(4), 9-19.
6. McNamara, P.J. and Sharief, N. (2001). Comparison of EML 105 and JAdvantage analysers measuring capillary versus venous whole blood glucose in neonates. *Acta Paediatrica*, 90, 1033-41.
7. Avery, GB, Fletcher, MA, MacDonald, MG (Eds). *Neonatology: Pathophysiology and management of the Newborn*. (1999). Philadelphia: Lippincott