Guidelines for the Management of Neonatal Hypoglycemia

1. Introduction:

-Clinically significant neonatal hypoglycemia (NH) is the result of an imbalance between glucose supply and other fuels such as ketone bodies, and lactate. As part of the physiological adaptation to extra uterine life, blood glucose concentrations often dip to 30 mg/dL (1.6mmol/L) within 1 to 2 hours after birth in healthy neonates, but they typically return to more than 45 mg/dL (2.5 mmol/L) with normal feeding within 12 hours. There is no evidence that this is in anyway harmful.

-Altered electrophysiological measurements and poor long term neurological outcome have been reported in infants with recurrent blood glucose level below 2.6 mmol/L

-Blood glucose level should not be measured in healthy term babies born after a normal healthy pregnancy but term infants who have symptoms of hypoglycemia require blood glucose measurements as soon as possible

-Routine screening and monitoring of blood glucose is recommended only for infants who have risk factors (e.g: IUGR, LGA, born to mother who have diabetes or preterm infants) or who have clinical manifestations of NH.

-Normal glucose utilization rates are 4-6mg/kg/min. Infants in high risk groups frequently require 6-10mg/kg/min. Babies requiring >10mg/kg/min usually have a pathological basis for their hypoglycemia

2. Definition:

-Blood glucose level below 2.6 mmol/L in newborn infant.

3. Babies Clinically at Risk of Hypoglycemia

3.1 Newborn risk factors:

- Preterm <37 weeks gestation
- Infection
- Asphyxia
- Hypothermia
- IUGR (<10^{th} centile for gestational age)
- Macrosomia/Large for gestational age birth weight>4 kg (>90^{th} centile for gestational age)
- Low birth weight (less than 2500 gm)
- Cardio-Respiratory problems: e.g: RDS,TTN,congenital heart disease
- polycythemia

- Severe Rhesus disease

- Hyperinsulinism:

    - Persistent hyperinsulinaemic hypoglycaemia of infancy
    - Beckwith Wiedemann Syndrome
    - Transient neonatal hypoglycaemia

- Other conditions include:

    - Endocrinopathies: Cortisol deficiency, Growth hormone deficiency, Hypothyrodism
    - Inborn errors of metabolism

3.2 Maternal risk factors:

- Maternal diabetes mellitus or impaired maternal glucose tolerance
- intrapartum administration of glucose
- Maternal drugs: Oral hypoglycemia agent, beta-blocker, Valporate

4. Clinical Presentation of hypoglycemia:

- Change in level of consciousness (irritability, lethargy, stupor, and coma)
- Seizures,tremor,jitteriness
- weak or high-pitched cry
- Poor feeding/vomiting
- Tachypnoea
- Hypotonia
- Temperature instability
- Apnoea
- Cyanosis/pallor
- Tachycardia or bradycardia

5. Management Principles:

- Prevent babies from becoming hypoglycemic
- Detect those babies that are hypoglycemic
- Treat those babies that are hypoglycemic
- Find a cause if the hypoglycemia is severe, persistent, or recurrent

6. Blood glucose level screening:

Babies should have blood glucose level (BGL) screening if:

- At least one risk factor is present
- They are unwell
- There are unexplained abnormal signs that maybe due to hypoglycemia

Flow chart (1): Preventive and screening for well newborn at risk for hypoglycemia

LPI (34wk-36wk+6) and SGA (screen: 0-24hr), IDM and LGA (screen: 0-12hr)

At birth:
-Keep baby warm
- Dry baby
- Early skin to skin contact

-Start feed before 1hour of age (must be fed by 1hr of age) and encourage frequent feedings at least 3hourly (either breast feed or formula)

Fed effectively

Yes

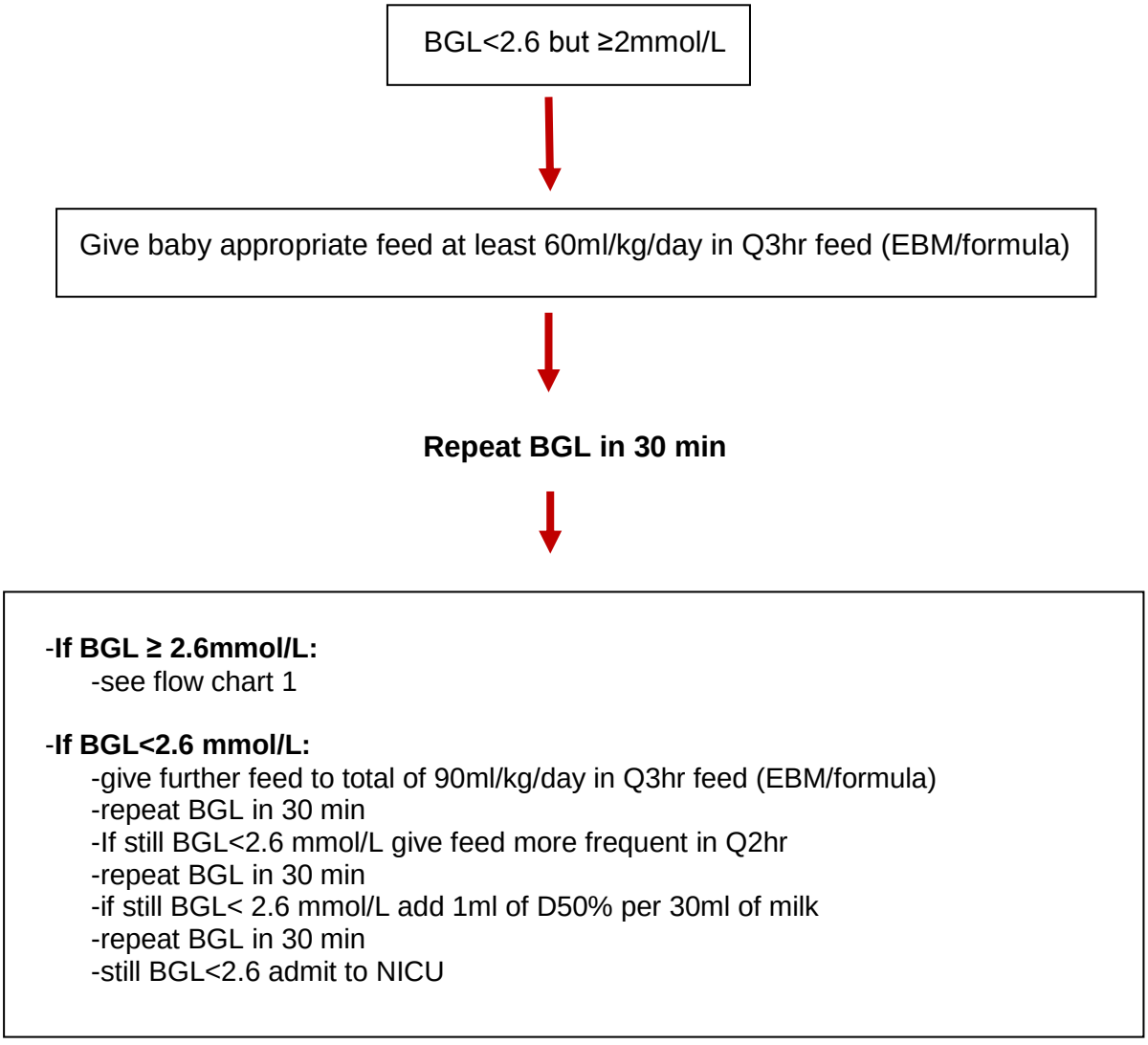
-Ongoing care:
- Keep baby warm
- Further skin to skin contact

-Pre feed observations for minimum 24 hr include: LOC, Tone, T, respiration, color/perfusion.
-continue at least 3 hourly feed or more frequently
-screen glucose 30min after 1st feed

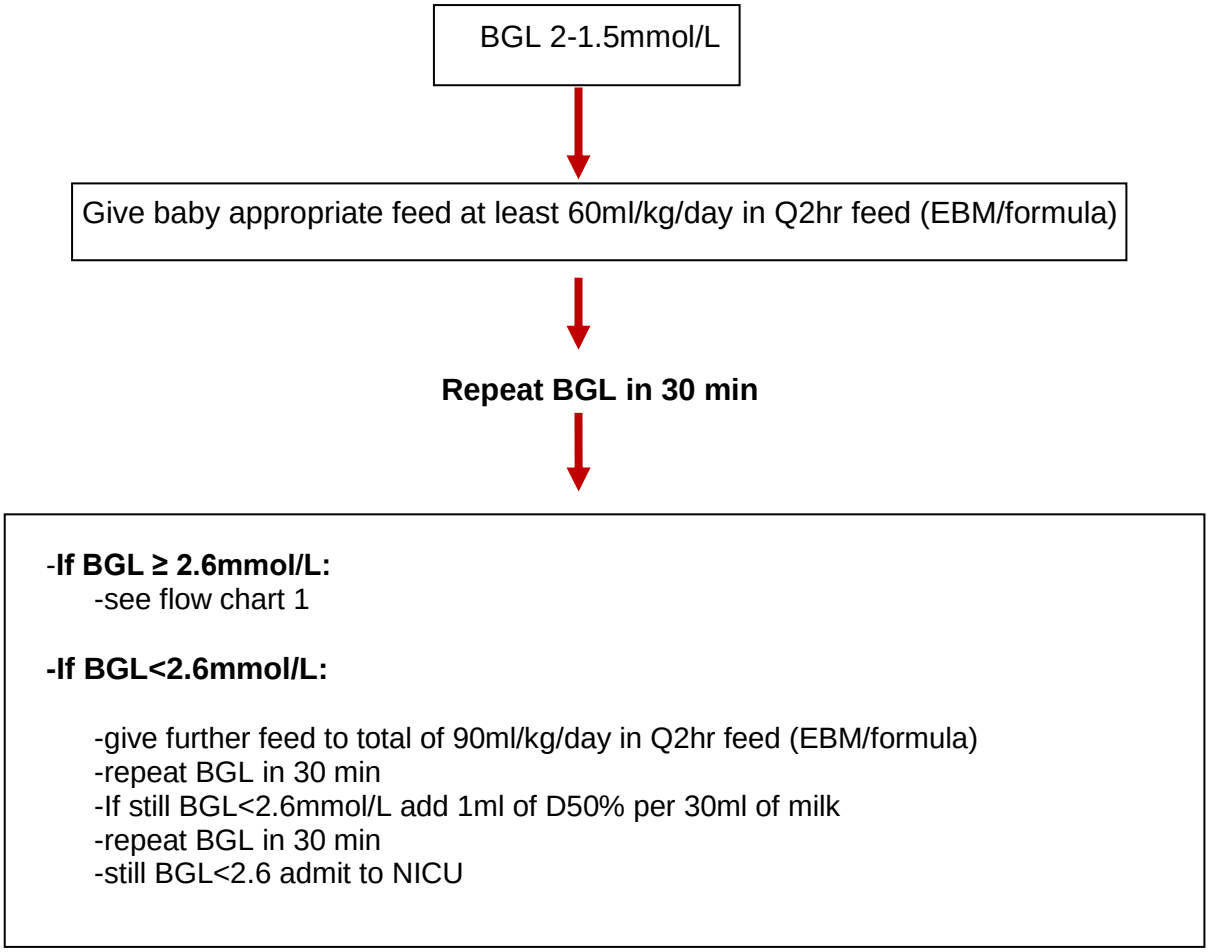
BGL ≥2.6mmol/L

-continue ongoing care
-continue at least 3hourly feed
-continue Pre-feed monitoring of BGL
-cease BGL monitoring if: BGL ≥2.6 mmol/L for 24hr and the baby is feeding effectively, and baby is well

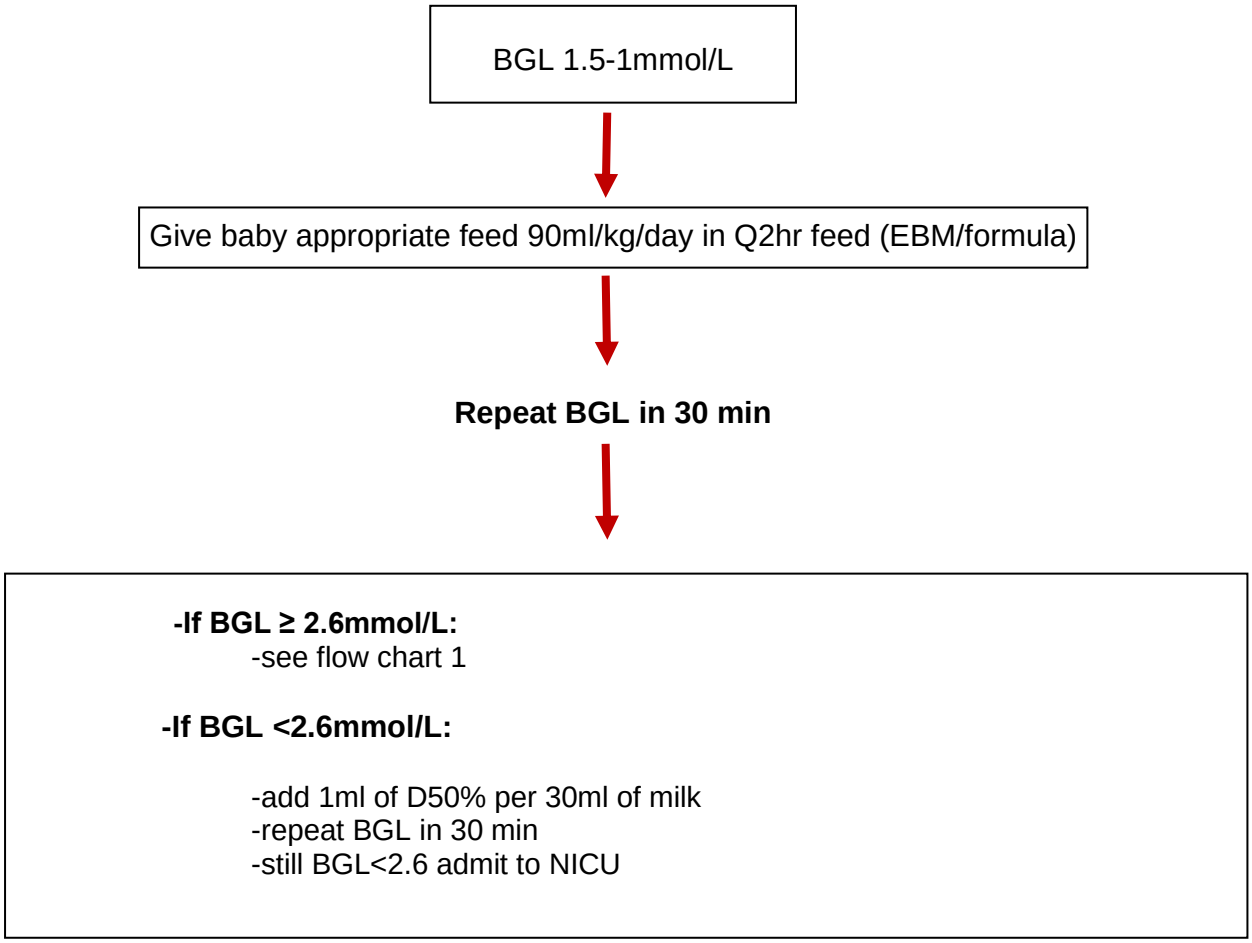
Flow chart (2.1): Management of Asymptomatic hypoglycemia in at risk newborn



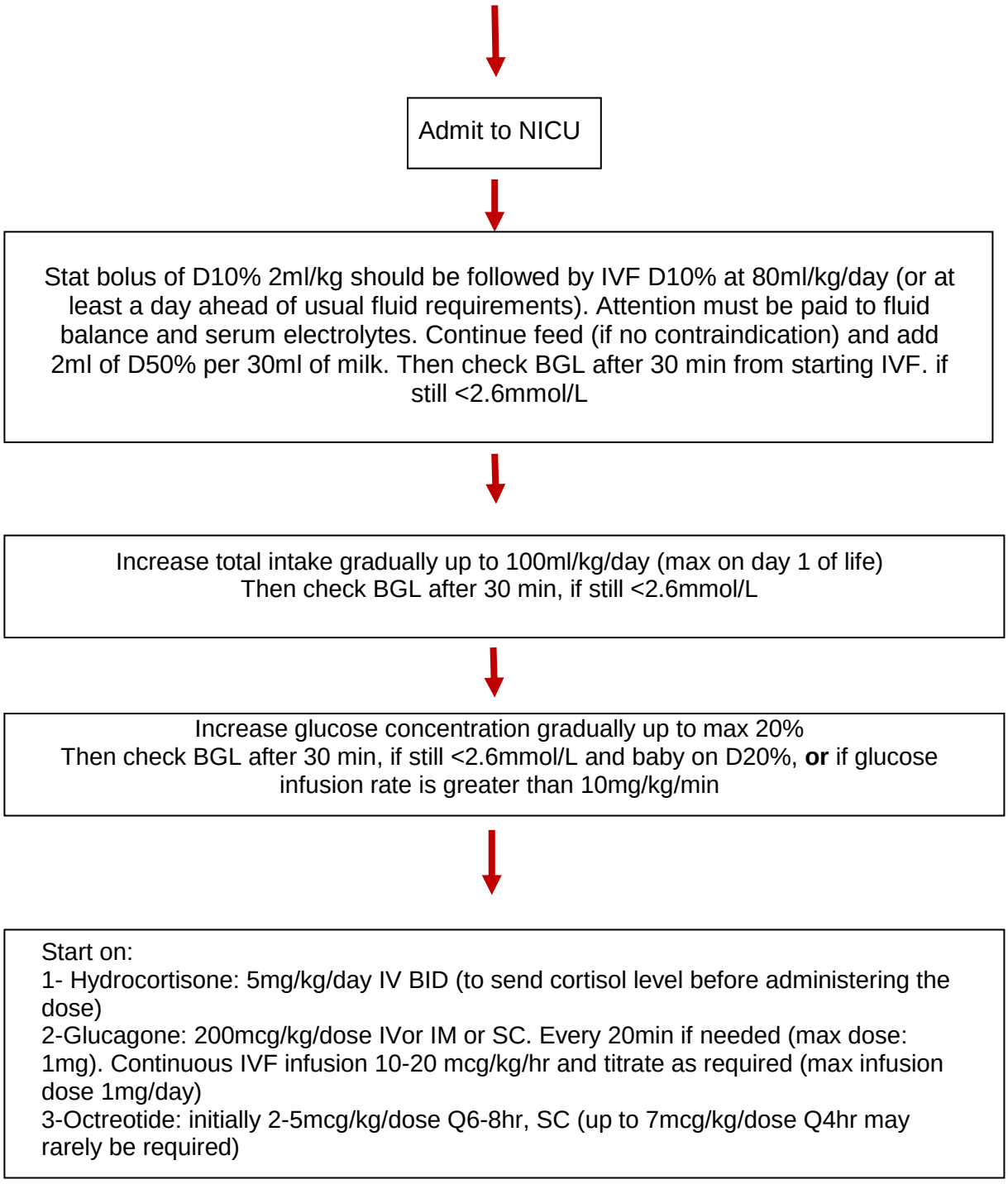
Flow chart 2.2



Flow chart 2.3



Flow Chart 3: Management of Symptomatic hypoglycemic newborn or if BGL<1mmol/L



Note:

-Never give a bolus of glucose alone, it must be followed by a continuous glucose infusion+/-milks feeds. And if baby on IVF never give IV bolus of glucose without also increasing the background rate or concentration of the glucose infusion (risk of rebound hypoglycaemia)

- Enteral feeds should be continued as tolerated (unless contraindicated or baby cant tolerated enteral feeding) if EBM not available, formula milk should be started

-BGL should be monitored every 30min till >2.6 mmol/L for two consecutive reading then to be monitored every 2hr-4hr.and should be checked 1hr after each change and pre feed as IVF reduced.

-Glucose therapy should be decreased gradually as enteral feeding is introduced And advanced (Any sudden interruption of IV glucose may result in profound hypoglycemia. Tissued IV drips must be urgently recited) and when blood glucose has been > 2.6 mmol/l for 2 consecutive measurements, attempt to reduce infusion rate gradually by 1-2 ml/hr, and if glucose concentration higher than 10%, reduce glucose concentration first then the infusion rate. If glucose concentration higher than 15%, every 8hrs reduce the glucose concentration till reaching concentration of 10%

-If BGL is low in babies who are fluid restricted increase concentration of glucose up to 20% (max 20%)

-Neonates requiring higher glucose concentrations (glucose concentration >12.5%) should have a central line placed to avoid extravasation of hyperosmolar glucose solution (never give more than 20mg/kg/min in any line including central line)

-Persistent or severe hypoglycemia (requiring more than 10mg/kg/min of glucose at any time **or** persisting/recurring after 72 hr) following investigations should be requested: GH,cortisole,Insulin,urine ketone, glucagon,AA chromatography,urine for organic acid and urine for AA. (Blood should be collected at BGL<2.2mmol/L)

-In any emergency particularly if there is difficulty in starting IV glucose infusion, glucagon 200mcg/kg IM will stabilize blood glucose in most babied for one to two hr. the dose can be repeated, but subsequent doses are much less likely be effective

-don’t discharge babies until they are at least 24hr, maintaining their blood glucose level and feeding well

-If symptoms do not resolve when blood glucose levels increase, a different diagnosis must be sought

-Never use boluses of 25% or 50% glucose: they are unnecessary and can be dangerous: rebound hyperinsulinism and hypoglycaemia are common, as are local complications of extravasation.

References

1- Newborn Services Clinical Guideline/Guideline for the Management of Hypoglycemia 2013
2- Queensland Clinical Guidelines/Newborn Hypoglycemia 2013
3- Nottingham Neonatal Service – Clinical Guidelines 2012
4- North Trent Neonatal Network Clinical Guideline 2012
5- Guidelines for Hypoglycemia screening and intervention in at Risk Infants. AAP 2012
6- Care of the Newborn hypoglycemia/Department of Neonatology BSUH 2010
7- NHS. Mid Essex Hospital Service. 2009

Dr. Mona Khalaf, August 2015

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Screening and Management of Postnatal Glucose Homeostasis in Late Preterm and Term SGA, IDM/LGA Infants

[(LPT) Infants 34 – 36$^{6/7}$ weeks and SGA (screen 0-24 hrs); IDM and LGA ≥34 weeks (screen 0-12 hrs)]

Symptomatic and <40 mg/dL ⟶ IV glucose

ASYMPTOMATIC

Birth to 4 hours of age

INITIAL FEED WITHIN 1 hour
Screen glucose 30 minutes after 1st feed

Initial screen <25 mg/dL

Feed and check in 1 hour

<25 mg/dL	25–40 mg/dL
↓ IV glucose*	↓ Refeed/IV glucose* as needed

4 to 24 hours of age

Continue feeds q 2-3 hours
Screen glucose prior to each feed

Screen <35 mg/dL

Feed and check in 1 hour

<35 mg/dL	35 – 45 mg/dL
↓ IV glucose*	↓ Refeed/IV glucose* as needed

Target glucose screen ≥45 mg/dL prior to routine feeds

* Glucose dose = 200 mg/kg (dextrose 10% at 2 mL/kg) and/or IV infusion at 5–8 mg/kg per min (80–100 mL/kg per d). Achieve plasma glucose level of 40-50 mg/dL.

Symptoms of hypoglycemia include: Irritability, tremors, jitteriness, exaggerated Moro reflex, high-pitched cry, seizures, lethargy, floppiness, cyanosis, apnea, poor feeding.