Normal Newborn

- During transitional hypoglycemia normal newborns have an enhanced ketogenic response to fasting.
- Newborn brains have enhanced capability to use ketone bodies for fuel
- Allows newborns to tolerate lower blood sugar levels during the establishment of breastfeeding
- **PROTECTS BRAIN**

Neurodevelopmental Risk?

- Increases in neurodevelopmental abnormalities have been found with hypoglycemia associated with abnormal clinical signs
- In otherwise normal asymptomatic newborns there is no evidence that transiently low blood sugars are associated with brain damage

But….

- Retrospective population based cohort of 1395 newborns with 1 low blood sugar between 0-3 hours of life
  - 10.3% had level <40
- In 4th grade these children had significantly decreased probability of proficiency in math and literacy
  - Odds of proficiency in literacy 0.43 (0.28-0.67)
  - Odds of proficiency in math 0.52 (0.34-0.78)

Kaiser et al. Jama 2015

But….

- 72 hypoglycemic newborns (27 symptomatic and 45 asymptomatic) compared to matched euglycemic controls
  - Neurodevelopmental outcomes assessed as 6 and 12 months of life
- Lower motor and mental development quotient at 6 and 12 months
  - Symptomatic infants and infants with blood sugar< 40 most significantly affected

Mahajan et al. Pediatr Neurol 2017

Check blood sugars in this baby?

- NO!
- Routine monitoring of blood glucose in healthy term newborns with no risk for developing hypoglycemia is unnecessary and interferes with establishment of breastfeeding
  - WHO
  - AAP

UW Health | UnityPoint Health Meriter

How can we support this mom?

- Initiate breastfeeding within 30-60 minutes of life and continue breastfeeding on cue
  - Initiating breastfeeding within 1 hour after birth makes a big difference! (Sumayam et al 2015)
- Facilitate early skin to skin contact
- Frequent feeds at least 10-12 times per day

Take Home Message

- 1. Early and Exclusive breastfeeding is safe to meet the nutritional needs of healthy term infants
- 2. Healthy term infants do not develop Clinically significant hypoglycemia simply as a result of a time limited duration of underfeeding

Oh NO!

- At about 8 hours of life you are helping this new mom work on establishing a deep latch. While you are doing this you notice that the baby is really jittery and doesn't look quite right. You do vitals and decide to check a blood sugar…..

Definition of Hypoglycemia?

- No evidence based definition of clinically important neonatal hypoglycemia (NIH Expert Panel 2008: Hay et al J Peds 2009)
- No specific plasma or serum glucose level that can be linked to either clinical signs or permanent neurologic injury

Thresholds

Hours After Birth	≤ 5th % Plasma Glucose Level
1-2 hours	28 mg/dL
3-47 hours	40 mg/dL
48-72 hours	48 mg/dL

Infant	Plan	Treatment
Clinical Signs	<45 mg/dL	intervention to increase blood sugar
Risk Factors	Screen within 2-4 hours after birth and before feeding. If < 36 mg/dL – follow closely and intervene if blood sugar stays < 36 or doesn't come up with feed	If < 25 IV Dextrose

Alkalay et al. AmJPerinat 2006

UW Health | UnityPoint Health Meriter

Current Controversy

- AAP Guidelines (2011)
  - First 4 hours maintain blood sugar > 40 mg/dL prior to feeding
  - 4-24 hours maintain blood sugar > 45 mg/dL prior to feeding
  - Symptomatic – treat if blood sugar is < 40mg/dL
- Pediatric Endocrine Society
  - Maintain blood sugar > 50 mg/dL in first 48 hours
  - Maintain blood sugar > 60 mg/dL after first 48 hours

What are the symptoms of hypoglycemia?

Unarrousability	Apnea	Lethargy	Heart Rate < 100
Seizures	Irritability	Heart Rate > 160	Hypotonia
Jittiriness	Tachypnea	High pitched cry	Sweating
Poor feeding	Cyanosis	Pallor	Vomiting
Respiratory Distress	Hyperactive Moro		

- **Most infants with hypoglycemia are asymptomatic**
- **Most symptoms of hypoglycemia are non specific**

What if it blood sugar is 50 mg/dL?

- Differential diagnosis of the jittery baby
  - Exposure to SSRIs
  - Exposure to tobacco
  - Exposure to opiates
  - Neurologic immaturity
  - Hypocalcemia
  - Hypoglycemia
- If blood sugar is > 40 look elsewhere for the cause of the jitters

It’s not – it’s 28 mg/dL

- Symptomatic hypoglycemia can lead to poor neurodevelopmental outcomes
- If blood sugar is < 40 and baby is symptomatic immediate intervention is needed
  1. Feed baby (EBM, donor milk, formula)
  2. Start IV Dextrose (or transfer baby somewhere this can be done)

UW Health | UnityPoint Health Meriter

Other things to think about…

- Check a temperature
  - Low blood sugar and low temperatures go hand in hand.
- Would you work this baby up?
  - Congenital Hyperinsulinism
  - Pituitary defect
  - Adrenal insufficiency
  - Genetic Metabolic defects

Case # 2: The BIG Baby

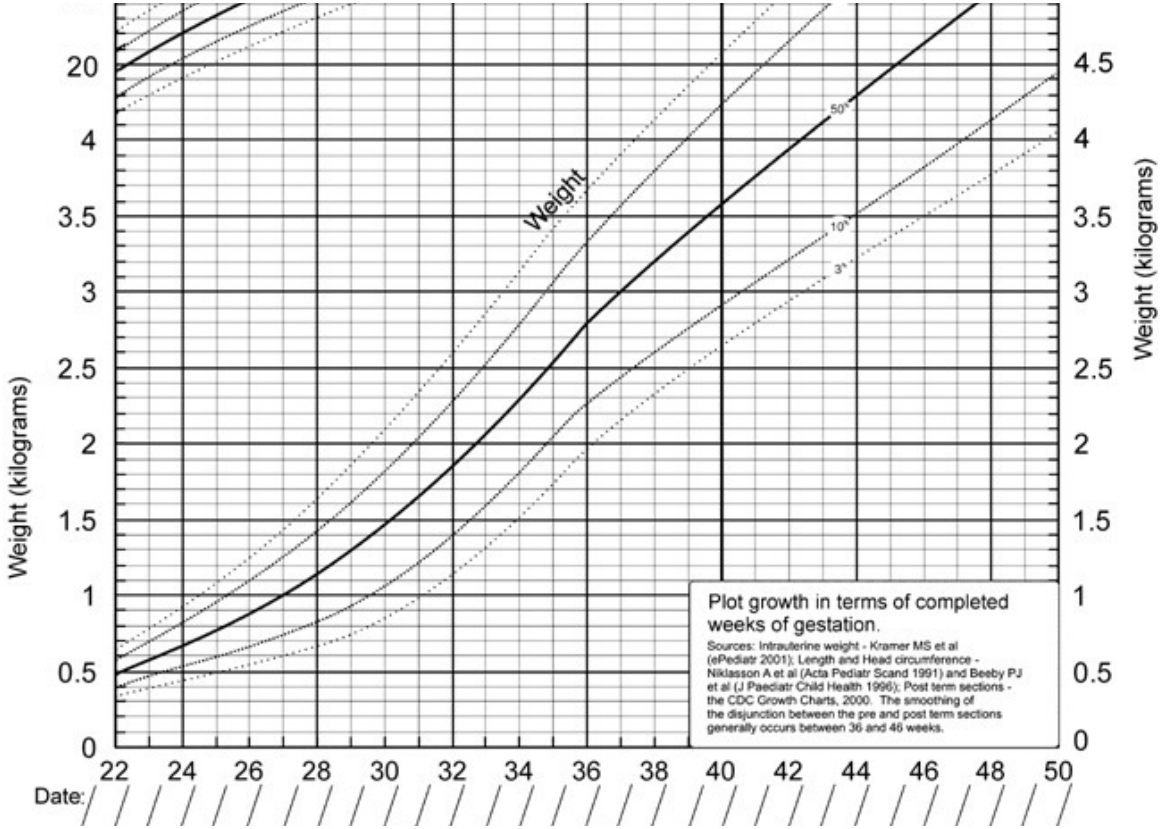
- A 40 0/7 week newborn is in your nursery.
- Born by vaginal delivery.
- Baby weighs 4050 gms (LGA)
- This is mom's third baby. She has breastfed the other two babies
- Mom is healthy but this pregnancy has been complicated by gestational diabetes

Risk Factors?

- Yes!
- LGA
  - Babies who are LGA have higher DEMAND than SUPPLY
  - May develop hypoglycemia as early as 3 hours of life
- IDM
  - Infants of Diabetic Mothers are Hyperinsulinemic
  - May develop hypoglycemia as early as 1 hour after birth and usually by 12 hours of age

UW Health | UnityPoint Health Meriter

A Brief Note on Size….



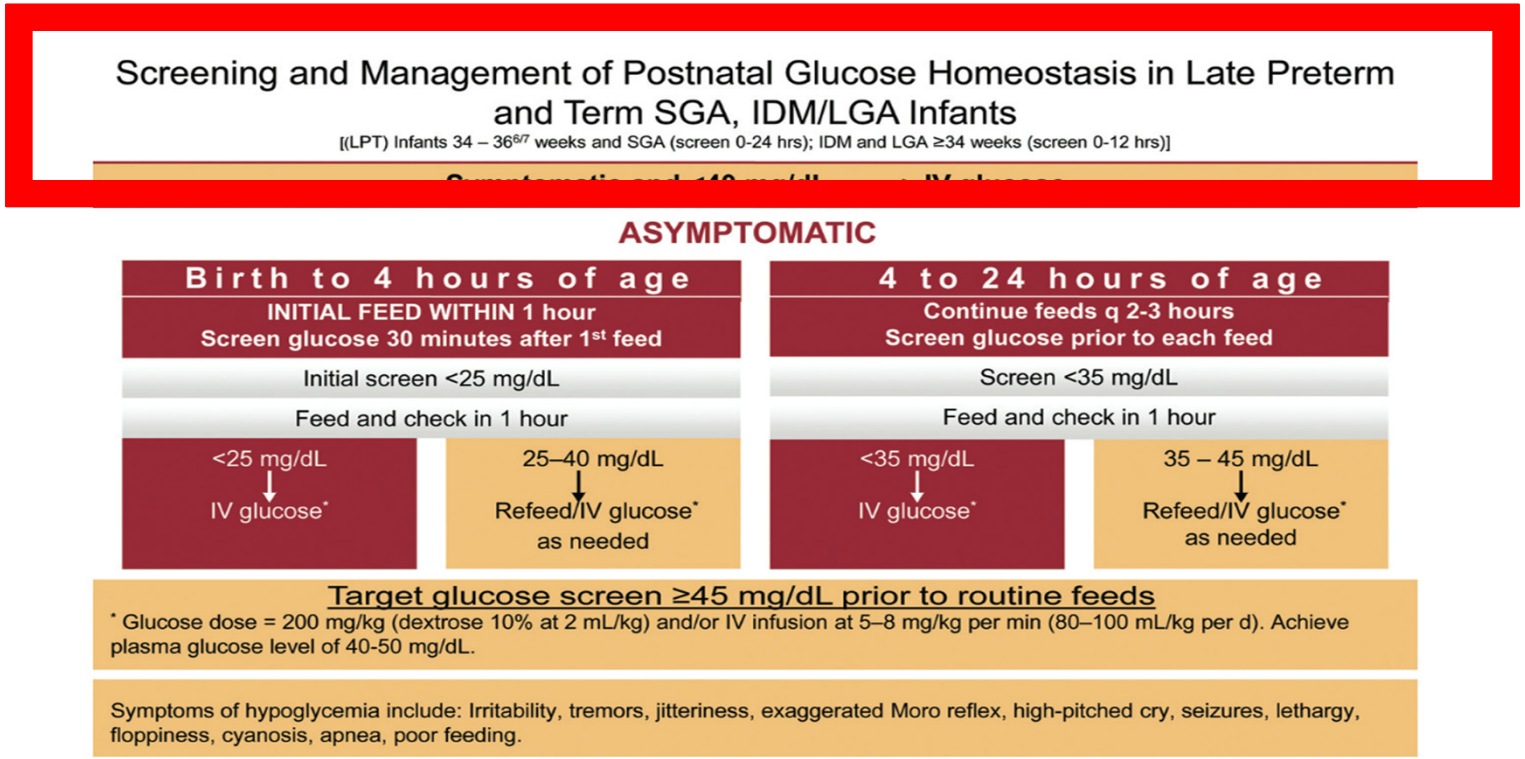
Fenton Growth Curve 2013

UW Health | UnityPoint Health Meriter

Do we screen this baby?

- Yes!
- Infants who are LGA and IDM are at increased risk for hypoglycemia
- Hypoglycemia is usually asymptomatic and are discovered by screening blood sugars

AAP Guidelines 2011



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)]

ASYMPTOMATIC

Birth to 4 hours of age		4 to 24 hours of age	
INITIAL FEED WITHIN 1 hour Screen glucose 30 minutes after 1st feed		Continue feeds q 2-3 hours Screen glucose prior to each feed	
Initial screen <25 mg/dL		Screen <35 mg/dL	
Feed and check in 1 hour		Feed and check in 1 hour	
<25 mg/dL ↓ IV glucose*	25–40 mg/dL ↓ Refeed/IV glucose* as needed	<35 mg/dL ↓ IV glucose*	35 – 45 mg/dL ↓ 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.

FIGURE 1

Screening for and management of postnatal glucose homeostasis in late-preterm (LPT 34—36⁶⁄₇ weeks) and term small-for-gestational age (SGA) infants and infants who were born to mothers with diabetes (IDM)/large-for-gestational age (LGA) infants. LPT and SGA (screen 0—24 hours), IDM and LGA ≥34 weeks (screen 0—12 hours). IV indicates intravenous.

UW Health | UnityPoint Health Meriter

Skin To Skin

- Immediate skin to skin contact after birth and for at least the first hour of life
  - Helps maintain normal body temperature
  - Reduces energy expenditure
  - Decrease in NICU admission from 8.1% to 3.5%
    (Chirovulu et al. PQS 2017)

BIG Baby

- Baby placed directly on mom's chest, does skin to skin, and latches on with no difficulty
- 30 minutes after completion of first breastfeeding blood sugar is measured

UW Health | UnityPoint Health Meriter

AAP: Initial Management

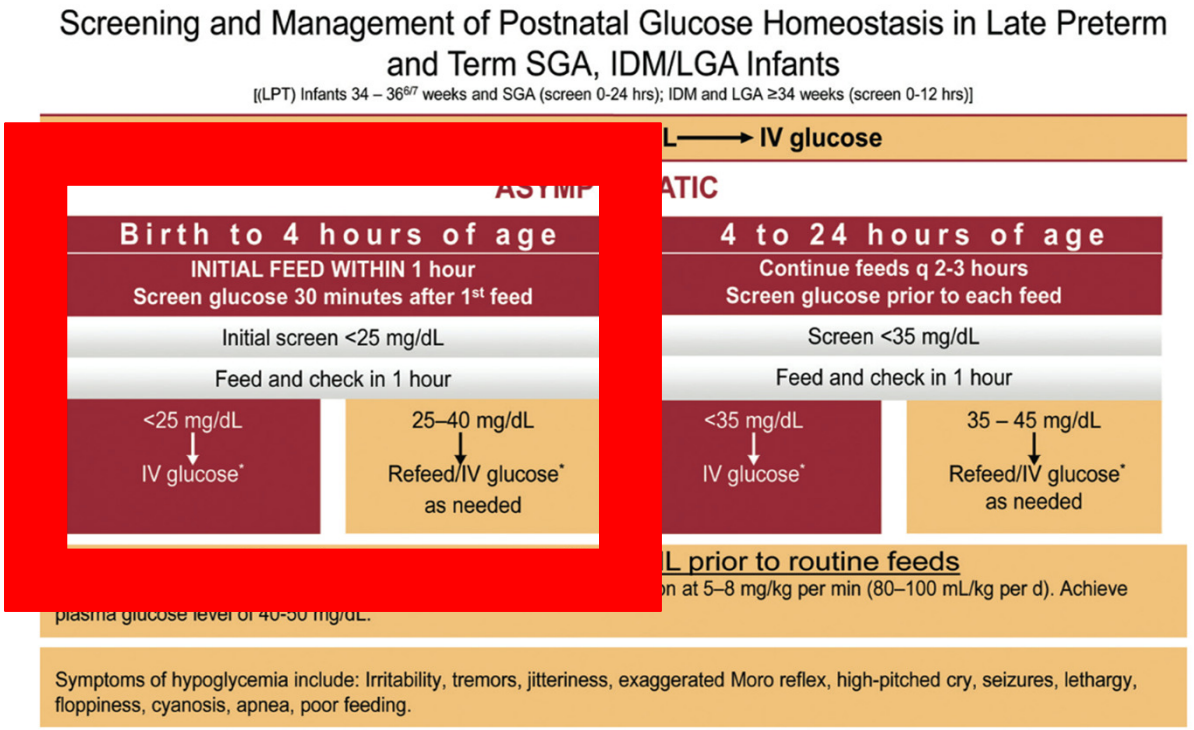


FIGURE 1

Screening for and management of postnatal glucose homeostasis in late-preterm (LPT 34–36⁶⁄₇ weeks) and term small-for-gestational age (SGA) infants and infants who were born to mothers with diabetes (IDM)/large-for-gestational age (LGA) infants. LPT and SGA (screen 0–24 hours), IDM and LGA ≥34 weeks (screen 0–12 hours). IV indicates intravenous.

UW Health | UnityPoint Health Meriter

ABM: Initial Management of Documented Hypoglycemia > 20

- Continue breastfeeding of feed 1-5 mL/kg EBM or substitute nutrition
  - Glucose water not acceptable
- Recheck blood sugar before subsequent feedings until value is acceptable and stable x 2
- Avoid forced feedings
- If blood sugar remains low despite feeding start IV dextrose
- Continue breastfeeding during IV glucose therapy

ABM: Initial Management of Documented Hypoglycemia ≤ 20

- Start IV dextrose
- Do not rely on oral or OG/NG feeding to correct extreme or clinically significant hypoglycemia
- Blood sugar level in babies who have had symptomatic hypoglycemia should be kept> 45 mg/dL
- Encourage frequent breastfeeding