

Purpose:

The appropriate screening and management of newborns at risk for low blood sugar is an important component of care of the newborn and can improve clinical outcomes for those newborns.

Scope:

The policy pertains to all staff members and physicians at Muskoka Algonquin Healthcare (MAHC).

Policy Statement:

This policy ensures safe, appropriate and consistent management of newborns at risk of and with hypoglycemia.

Definitions:

POCT: point of care testing

Dextrose gel: 40% dextrose gel that is applied to the buccal mucosa at 0.5 ml/kg. This dose provides 200 mg/kg of glucose, equivalent to an IV bolus of 2 ml/kg of D10W solution.

Target Patient Population:

The following infants meet criteria for the **12 hour** blood glucose monitoring regime

- Birth weight greater than 90th percentile (LGA)
- Infant of a diabetic/gestational diabetic mother

Consideration should also be given to assessing infants who have required resuscitation beyond routine post-delivery care and those whose mothers have been on labetalol.

The following infants meet criteria for the **24 hour** blood glucose monitoring regime

- Less than 37+0 weeks gestational age (GA)
- Infant whose birth weight is less than the 10th percentile (SGA)

Exclusions = Infants with the following conditions require transfer to Level II NICU

- Symptomatic with clinical signs of hypoglycemia
- Infants with RDS, Sepsis
- Inability to maintain blood glucose according to this protocol
- Hypothermia not responding to interventions

Table 1. 10th and 90th percentile cut-offs for birthweight at term in Canadian infants

Gestational Age (completed weeks)	Birth Weight (g)			
	10th percentile		90th percentile	
	Male	Female	Male	Female
37+0	2552	2452	3665	3543
37+1	2583	2481	3695	3571
37+2	2613	2511	3726	3599
37+3	2644	2540	3756	3627
37+4	2674	2570	3786	3654
37+5	2705	2599	3816	3682
37+6	2735	2629	3847	3710
38+0	2766	2658	3877	3738
38+1	2791	2682	3902	3760
38+2	2816	2706	3926	3783
38+3	2841	2730	3951	3805
38+4	2867	2753	3975	3827
38+5	2892	2777	4000	3850
38+6	2917	2801	4024	3872
39+0	2942	2825	4049	3895
39+1	2962	2844	4071	3915
39+2	2981	2862	4092	3935
39+3	3001	2881	4114	3955
39+4	3020	2899	4135	3974
39+5	3040	2918	4157	3994
39+6	3059	2936	4178	4014
40+0	3079	2955	4200	4034
40+1	3093	2967	4218	4051
40+2	3108	2982	4237	4068
40+3	3122	2996	4255	4085
40+4	3136	3010	4273	4103
40+5	3150	3023	4291	4120
40+6	3165	3037	4310	4137
41+0	3179	3051	4328	4154
41+1	3187	3060	4343	4168
41+2	3194	3069	4358	4182
41+3	3202	3078	4373	4196
41+4	3210	3087	4388	4209
41+5	3218	3096	4403	4223
41+6	3225	3105	4418	4237
42+0	3233	3114	4433	4251

Adapted from Kramer MS, Platt RW, Wen SW, et al; Fetal/Infant Health Study Group of the Canadian Perinatal Surveillance System. A new and improved population-based Canadian reference for birth weight for gestational age. *Pediatrics* 2001;108(2):E35.

Implementation Considerations:

- Blood glucose to be maintained greater than/equal to 2.6 mmol/L (lab value) during the first 72 hours of life
- Maintaining thermal regulation promotes glucose homeostasis e.g. by skin to skin contact
- The diagnosis of hypoglycemia should never be made solely on the basis of point of care testing results. A serum sample should be sent to the lab if POCT glucose level is less than 2.6 mmol/L.
- Mothers who are breastfeeding will need education and the ability to demonstrate hand expression skills

Procedure:

1. Babies at-risk should receive at least one feed before blood glucose is checked at 2 hours of age. This feed should include correct latch and position of baby and adequate sucking if breastfeeding or observations of an adequate amount of formula retained if alternative feeding (10-15 mL)
2. Initiate first feed within 30-45 minutes of birth and ensure effective feeding q 2-3 hours minimum
3. Assess for signs and symptoms of hypoglycemia with each intervention until discharge
4. If clinical signs of hypoglycemia noted or if infant not able to maintain blood glucose, call MRP and consider transfer of infant to Level II NICU.
5. Discontinue glucose monitoring on completion of all ordered blood glucose checks and continue to assess for signs and symptoms of hypoglycemia prior to each feeding and PRN until discharge

Supplementation

1. Supplementation may be used with an order from MRP in asymptomatic infants with lab blood glucose 1.8 mmol/L to 2.5 mmol/L to augment caloric intake prior to considering starting an IV. Blood glucose level should be rechecked 30 minutes post feed to identify persistent hypoglycemia.
2. If supplementation is required as per assessment or to maintain/raise blood glucose, provide expressed colostrum/EBM and/or formula (colostrum/EBM is first choice)
3. If formula is required, discuss medical reasons and options of feeding methods with parent (if gavage feeding is required, then as per unit policy)

Supplementation Volumes

1. If blood glucose is less than 2.6 mmol/L, ensure feeding (EBM or formula) according to the following volumes. Offer volumes up to the following volumes as tolerated]:
 - Birth-24 hours: 5-10mL/kg/feed (offer 5 mL/kg for the first feed at 30-45 minutes of life)
 - 24-48 hours: 10-12 mL/kg/feed
 - 48-72 hours: 12-15 mL/kg/feed

- Consider the blood glucose result and age of infant in hours when deciding volume to provide

Blood Glucose Monitoring:

12 hour Blood Glucose Monitoring Regime (LGA and IDM):

1. Blood glucose at 2 hours of age, then prior to feeds approximately q 3 - 6 hours until approximately 12 hours of age
2. If an episode of hypoglycemia has occurred, ensure that the last 2 pre-feed blood glucose levels have been within normal limits over at least 6 hours before discontinuing this clinical protocol

24 hour Blood Glucose Monitoring Regime (SGA and <37+0 weeks gestation):

1. Blood glucose at 2 hours of age, then prior to feeds approximately q 3 - 6 hours until 24 hours of age; can then discontinue provided no feeding concerns and baby is well
2. If an episode of hypoglycemia has occurred, ensure that the last 2 pre-feed blood glucose levels have been within normal limits over at least 6 hours before discontinuing this clinical protocol

Management of Hypoglycemia Episodes:

For blood glucose less than 2.6 mmol/L at 2 hours of age or any subsequent check:

- Give 40% dextrose gel 0.5 ml/kg and breastfeed **OR**
- Feed 5 ml/kg (EBM, donor milk or formula) and breastfeed
- Recheck glucose **30 min** post feed

If tolerating feeds and blood glucose between 1.8 mmol/L - 2.5 mmol/L at subsequent check:

- Give 40% dextrose gel 0.5 ml/kg and breastfeed **OR**
- Feed 5 ml/kg (EBM, donor milk or formula) and breastfeed
- Recheck glucose **30 min** post feed

For blood glucose 1.8 mmol/L - 2.5 mmol/L on two occasions consecutively:

- Notify MRP
- consider IV and transfer to Level II NICU
- consider temporizing with 40% dextrose gel 0.5 ml/kg as preparing for IV

If blood glucose less than 1.8 mmol/L:

- Notify MRP
- consider IV and transfer to Level II NICU
- consider temporizing with 40% dextrose gel 0.5 ml/kg as preparing for IV

References:

CPS Position Statement: The screening and management of newborns at risk for low blood glucose:
November 2019

Dextrose gel for neonatal hypoglycemia (The sugar Babies Study), Lancet 2013 2` ; 382 (9910); 2077 83.

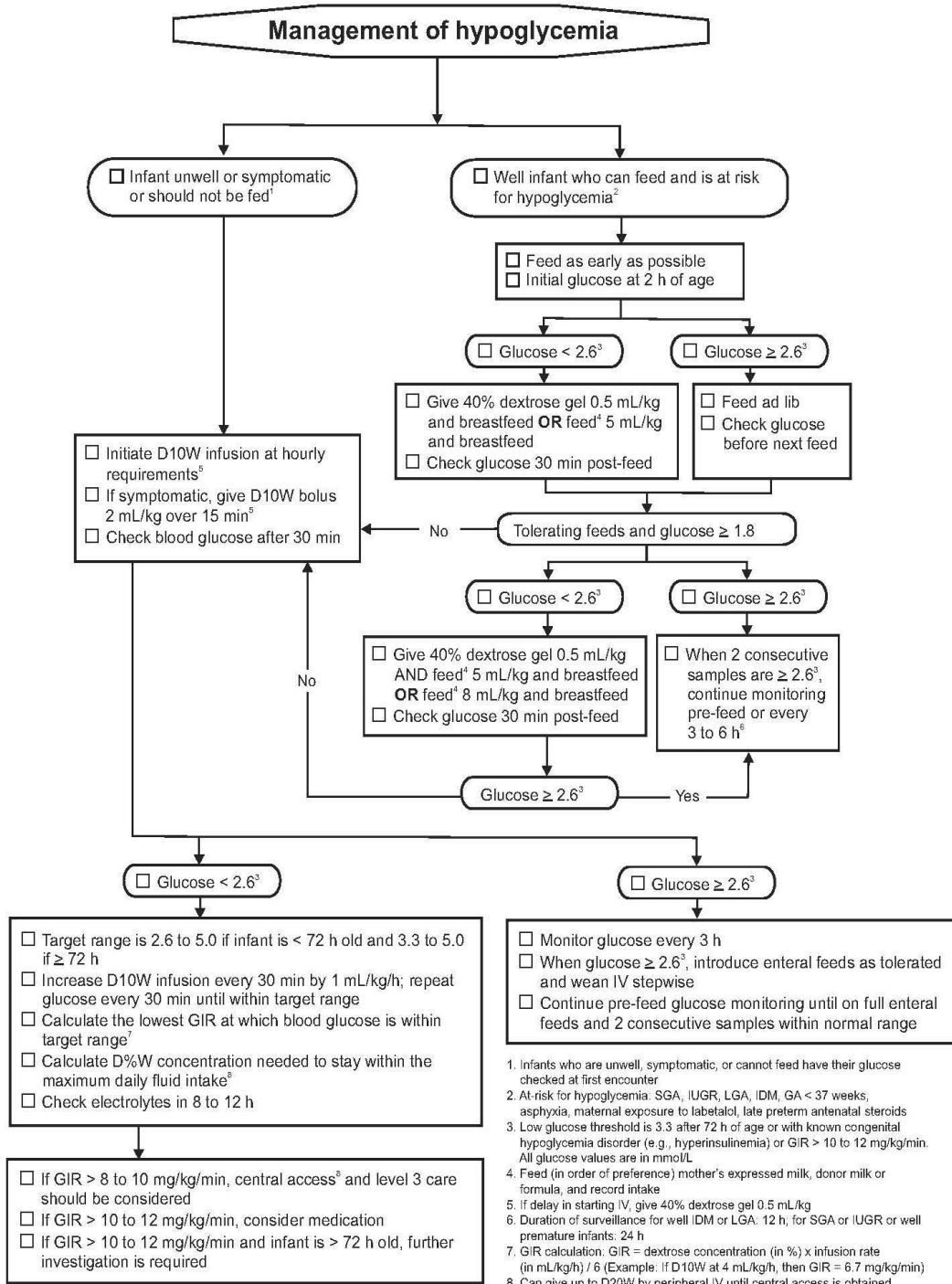
MAHC Neonatal Hypoglycemia Protocol; November 2017

Kramer MS, Platt RW, Wen SW, et al; Fetal/Infant Health Study Group of the Canadian Perinatal Surveillance System. A new and improved population-based Canadian reference for birth weight for gestational age. Pediatrics 2001;108(2):E35.

Appendices:

Appendix 1 – Management of Hypoglycemia Algorithm

Appendix 2 - Caring for Kids (cps.ca): Checking blood glucose in newborn babies information sheet for parents



Abbreviations: Ca - calcium, D%W - %age dextrose in water (e.g., D10W = dextrose 10% in water), GA - gestational age, GIR - glucose infusion rate, h - hours, IDM - infants of diabetic mothers, IUGR - intrauterine growth restriction, IV - intravenous, K - potassium, LGA - large for gestational age, min - minutes, Na - sodium, SGA - small for gestational age

1. Infants who are unwell, symptomatic, or cannot feed have their glucose checked at first encounter
2. At-risk for hypoglycemia: SGA, IUGR, LGA, IDM, GA < 37 weeks, asphyxia, maternal exposure to labetalol, late preterm antenatal steroids
3. Low glucose threshold is 3.3 after 72 h of age or with known congenital hypoglycemia disorder (e.g., hyperinsulinemia) or GIR > 10 to 12 mg/kg/min. All glucose values are in mmol/L
4. Feed (in order of preference) mother's expressed milk, donor milk or formula, and record intake
5. If delay in starting IV, give 40% dextrose gel 0.5 mL/kg
6. Duration of surveillance for well IDM or LGA: 12 h, for SGA or IUGR or well premature infants: 24 h
7. GIR calculation: GIR = dextrose concentration (in %) x infusion rate (in mL/kg/h) / 6 (Example: if D10W at 4 mL/kg/h, then GIR = 6.7 mg/kg/min)
8. Can give up to D20W by peripheral IV until central access is obtained

Checking blood glucose in newborn babies

What is blood glucose?

Blood glucose is a sugar that moves through the bloodstream and provides energy to all the cells in the body. It is one of your baby's most important sources of energy.

Babies with normal blood glucose levels have all the energy they need for healthy growth and development. However, in rare cases, blood glucose levels can fall too low and cause a baby to become sick.

Where do babies get glucose?

Babies get glucose through the placenta and umbilical cord while in their mother's uterus (womb). Some of that glucose is used right away as energy and some is stored for after birth. This stored glucose helps keep your baby's levels normal for the first few days of life until she is feeding well.

Once mom's breast milk is established (usually by a baby's third day of life), it becomes the main source of sugar for your baby. The sugar in milk changes to glucose in the body. When this happens, your baby will also start to store glucose for use between feeds.

Why do some babies have low blood glucose?

- In **healthy full-term babies** (babies born after 37 weeks), blood glucose levels are at their lowest 1 to 2 hours after birth. After this, the levels usually start to rise as your baby's body starts to use healthy sugar and fat stores.
- **Small and preterm (early) babies** may not have enough stores to keep the level up without extra feedings. These babies are most at risk for low blood glucose in the first 24 hours of life.
- **Babies whose mothers have diabetes** (especially mothers who need insulin or have diabetes that is not well controlled) may have trouble using their glucose stores. The normal rise in blood sugar that takes place after birth may not happen right away.
- **Babies who are large for their gestational age** (also called "large-for-dates") may have the same kind of problem during the first 12 hours of life.

Usually, low blood glucose levels will only last for a few hours, but can last up to 24-72 hours. Once your baby's levels become normal, he shouldn't have further problems with hypoglycemia (another name for low blood glucose).

In very rare cases, low blood sugar can be severe or last a long time. If this happens, your doctor will do special tests to look for other causes.

Do all newborn babies need blood glucose checks?

Healthy full-term babies do not need blood glucose checks. They have enough stored energy to last them until breastfeeding is going well. Babies who are not well will need blood glucose checks and other tests.

Some babies are more at risk for low blood glucose. Babies who need routine glucose checks include:

- Preterm babies born more than 3 weeks before they are due (36 weeks gestation or less).
- Babies who are small for their gestational age (or "small-for-dates"), particularly if their growth was poor in the last few weeks of pregnancy.
- Babies whose mothers had diabetes during or before pregnancy.
- Babies who are large for their gestational age.
- Babies with rare medical conditions that cause low blood glucose.

How is blood glucose checked?

Blood glucose is checked with just a few drops of blood, usually taken from your baby's heel.

If your baby is at-risk (see above) but doing well, blood glucose will be checked around 2 hours of age and then again before your baby feeds. In total, it will be checked about 3 to 5 times during the first and second days of life.

Why is low blood glucose dangerous to babies?

If a baby is already sick with low blood glucose—especially if it lasts for several hours—she may be at risk of long-term problems with development or learning.

What is the normal level of blood glucose in a baby?

Blood glucose is measured in millimoles per litre (mmol/L). Newborn babies should be treated when a single blood glucose test is less than 2.6 mmol/L in the first 72 hours of life, but by 72 hours of age should be greater than 3.3 mmol/L.

What do I do if my baby has low blood glucose levels?

Your baby will be checked for signs of illness. He will need extra feedings if his levels don't rise on their own. The extra feeds can be given:

- from the breast,
- as expressed breast milk, or
- as formula.

If the extra feedings don't raise the blood glucose level, glucose gel (a gel with sugar) can be provided with a feed to raise the blood sugar. This can be repeated once, but if your baby's blood sugar remains low or if your baby is not able to feed well, they will need intravenous treatment (through a needle or tube inserted into the body). Preterm babies or babies with low birth weight often have an intravenous started when they are born.

How long will blood glucose checks or additional treatments be needed?

Blood glucose levels usually get back to normal within 12 hours to 72 hours (3 days) of birth, especially once your baby is feeding regularly.

It's rare for full-term babies to continue having trouble with their blood glucose levels. If this happens beyond 24 hours, your baby's doctor may want to do more tests.

How can I prevent low blood glucose in my baby?

The most natural way to feed your baby and to keep a normal blood glucose level is early and frequent breastfeeding. Talk to your health care provider before you start using breast milk substitutes (formula).

It's also important to know if your baby is at risk for low blood glucose (see above).

Do not smoke during pregnancy. Babies who are exposed to tobacco don't grow well.

More information from the CPS:

- Breastfeeding
- Prenatal health and your baby
- Screening guidelines for newborns at risk for low blood glucose (position statement)

Reviewed by the following CPS committees:

- Fetus and Newborn Committee

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