

# Guidelines for the Management and Prevention of Neonatal Hypoglycaemia in the at-risk infant

## Maternity Staff

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## Foreword

NHS Highland is committed to promoting breastfeeding as the healthiest way for a mother to feed her baby. The important health benefits of breastfeeding are now known to exist for both mother and baby. NHS Highland will support the physiological and psychological function required to establish this natural maternal infant process.

This guidance is necessary to ensure that breastfeeding is encouraged and supported. Exclusive breastfeeding optimises health outcomes and evidence demonstrates that the prescribing of unnecessary supplements of formula can be detrimental to successful breastfeeding.

Early and exclusive breastfeeding is all a healthy term baby requires to meet its nutritional needs for the first 6 months of life. Healthy term newborn babies are not at risk of developing symptomatic hypoglycaemia as a result of simple underfeeding<sup>1</sup> However women often feel that they have to give their baby supplements due to pressure from staff or false beliefs that their baby is at risk from non supplementation.

The Infant Feeding Survey 2010 cited the following which demonstrates the need for careful supplementation to support, promote and encourage breastfeeding<sup>2</sup>

- Just over three in ten breastfed babies had received additional feeds in the form of formula, water or glucose while in hospital (31%). This practice was particularly associated with those starting life in special care (73%), prematurity (67%) and receiving phototherapy for jaundice (63%). In about 14% of cases, additional feeds had been given on advice and in 10% of cases, it was because the mother wanted to. The remaining 7% said that neither of these applied.
- Provision of formula or additional drinks was associated with an increased likelihood of stopping breastfeeding in the early weeks, particularly for those who wanted to do so, as opposed to doing so on advice. By the end of the first week, 42% of those who wanted to give additional feeds and 21% of those advised to do so had stopped breastfeeding, compared with 10% of mothers who exclusively breastfed in hospital.

This guidance is in place to support babies who have risk factors which make them more vulnerable to hypoglycaemia, however some babies may be reluctant to feed, appear unsettled or feed frequently and pathways have been incorporated within this guidance to assist health professionals with the management of these babies and prevent additional problems or unnecessary supplements. The pathways for the reluctant feeder and frequent feeder can be found in Appendix 2 and Appendix 3 of this document.

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## Equality and Diversity

NHS Highland ensures that the individual needs of mothers and their babies are given due consideration. In order to understand individual need, staff need to be aware of the impact of any barriers in how we provide services.

Staff are advised to:

- Check whether mothers require any kind of communication support including an interpreter to ensure that they understand any decisions being made.
- Ensure that they are aware of any concerns a mother may have about coping with breastfeeding and any decisions made.
- Ensure that any mother who has a disability that may require individualised planning re breastfeeding practice is appropriately supported.

### 1. Aims and Objectives

- To ensure that all maternity and paediatric staff are able to recognise unsettled babies, reluctant feeders and “at risk” babies thus enabling them to manage these babies effectively with the use of the appropriate pathway – Appendix 1 – 3.
- To ensure health professionals support breastfeeding mothers to meet their baby’s nutritional needs by exclusive breastfeeding or if necessary by the supplementation of colostrum, expressed breast milk (EBM) or donor expressed breast milk (DEBM) where appropriate.
- Adopt new UNICEF standards in breastfeeding and relationship building and include parents as partners in care.
- To ensure all health professionals are confident to encourage and teach breastfeeding mothers how to express their breast milk (via hand or pump) if their babies are unable to feed effectively. Thus ensuring that all attempts are made to provide breast milk for babies requiring supplementation. This will help reduce the unnecessary use of formula and ensure adequate breast milk supply for future lactation.
- The mothers of formula-fed babies should be shown how to feed their babies safely and effectively. Adopt new UNICEF standards of closeness and feeding soon after birth and encourage responsive bottle feeding and closeness. Frequent feeding is necessary if infant falls under the category of “at risk”
- To ensure health professionals understand the importance of regular observation of the baby’s condition and are able to recognise abnormal behaviour and/or recordings. They will also be able to identify when Paediatric assistance is required.
- To ensure that health professionals appreciate the appropriate timing of blood glucose monitoring and are confident in recognising when referral to a Paediatrician is necessary.

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- To ensure breastfed babies' needs are met as far as possible from breast milk. Exclusive use of breast milk optimises health outcomes
- Breast milk enhances the baby's ability to counter-regulate whereas large volumes of formula suppress this ability.

#### Correct Documentation

- Health professionals will be conversant with the need for accurate documentation and recording of the management of any problem feeder or 'at risk' baby (The use of the Post Natal Hypoglycaemic (appendix 4) chart should be commenced in labour suite at first feed).
- Any reason for deviation from the management plan must be documented comprehensively in the maternal handheld record and also in the baby's medical notes.
- Please also tick the box in the Labour suite ledger to highlight babies that are on the hypoglycaemic protocol. This will aid effective audit.

## 2. Introduction to the Guideline

### Evidence to support this Guidance in the prevention of hypoglycaemia of the newborn.

Prior to birth, the fetus receives nutrition via the placenta. At delivery the baby must adapt to the sudden separation from placental sustenance and to the introduction of milk feeds. During the last trimester the foetus lays down stores of carbohydrates and fat. The healthy term baby is able to utilise this fuel after birth via hormonal and enzyme responses which help to convert stores of glucose and fat to provide energy for the baby.

- The secretion of insulin is inhibited to help sustain blood glucose levels.
- Glycogen reserves are broken down and utilised as glucose.
- Synthesis of glucose is activated from stores in the liver.
- Fat is broken down in the liver to form other fuels e.g. ketone bodies which are important alternative fuels to glucose. These protect the neonatal brain and other vital organs from the effects of lowering blood glucose levels that naturally occur in the first 24 – 48 hours after delivery until feeding is established.

This process of release and utilization of stored fuels after birth is called neonatal metabolic adaptation.<sup>3,4,5</sup>

Monitoring blood glucose in healthy term babies leads to anxiety for both parents and staff and can result in the unnecessary supplementation of formula milk feeds for breastfeeding mothers. Routine blood glucose monitoring of healthy term babies are not required as ongoing assessment for clinical signs of hypoglycaemia and dehydration will be sufficient.

Studies suggest there is a component in breast milk that enhances the baby's ability to counter regulate blood sugar levels and ketone body responses. Large volumes of formula suppress this natural ability. Unnecessary supplements of formula results in a downward

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spiral of intervention which can ultimately lead to undermining the mother's ability to provide adequate nutrition for her baby resulting in the cessation of breastfeeding.

### 3. Management of babies at risk of hypoglycaemia on the postnatal wards

#### Introduction

There are a number of babies who are unable to make the appropriate metabolic adaptations to extra-uterine life and are considered at risk of hypoglycaemia. These babies need a more structured support. The risk of hypoglycaemia is greater in the first 24 hours of life for the at risk infant and therefore regular blood glucose estimations are required.

At risk babies need to be identified before or at delivery and managed accordingly:

#### Risk factors

- Mother gestational or insulin dependent diabetic.
- Prematurity <37 weeks.
- Intrauterine growth restriction (IUGR)
- Low birth weight <2.5kg
- Sustained hypothermia.
- Infection or unwell baby
- APGARS < 7 at 5 minutes.
- Maternal use of antihypertensive drugs such as labetalol. <sup>6,7,8,9,10</sup>

MCADD is a disorder of fat metabolism and babies are at great risk of hypoglycaemia. Adequate energy intake is essential for this babies as will prevent the mobilisation of harmful fatty acids. Families with a history should be referred to the paediatric consultants prior to birth. Frequent feeds with routine supplements are required of formula or EBM at a rate of 60ml/kg/day in the first 72 hours.

By nature of their condition at risk baby's counter-regulatory response is either immature or impaired. These babies are more at risk of neurological impairment if blood glucose levels remain low for a sufficient length of time.

At risk babies have impaired physiological responses and therefore may lack energy. These babies cannot be relied upon to demonstrate feeding cues or feed regularly or effectively.

At risk babies may have less subcutaneous fat and are more prone to hypothermia. It is important to keep baby warm otherwise they may have to burn precious energy to keep warm which will increase their risk of hypoglycaemia.

A structured feeding regime is required for babies with regular pre-feed blood glucose monitoring. <sup>7,8,9,10</sup>

#### Definition of Hypoglycaemia

Hypoglycaemia is:

- a blood Glucose level (BGL) of less than 2.6mmol/L. <sup>1</sup>

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Severe hypoglycaemia is:

- a BGL of <1.5 mmol/L.
- a BGL < 2.6 despite intervention such as top-ups or I.V Infusion

Persistent or recurrent hypoglycaemia is controversial, but one could say:

- Any 3 BGL <2.6mmol/L.
- BGL< 2.6mmol/L recurring/persisting after 72 hours.

### **Management of the at risk infant deemed well enough to be with the mother in the postnatal setting**

- Identify at risk babies prior to or at delivery, if unexpected risk factors apparent. All necessary equipment should be available i.e. warm room, heated resuscitative equipment, warm towels/ blankets and hat's etc.
- Skin to skin contact at delivery. Dry baby at birth to avoid the risk of evaporation of birth fluids and cover mum and baby with a dry warm towel. A hat can be placed on baby to avoid further heat loss.<sup>4</sup> Skin to skin will also support emotional wellbeing.
- An early breastfeed is essential and skin to skin will facilitate this. Try to encourage a breastfeed as soon as possible at least within the first hour of birth. If baby is to formula feed give formula of choice in labour suite 60mls /kg/day.<sup>8</sup>
- If baby is reluctant to feed in labour suite, hand express colostrum and give via syringe. Continue skin to skin and regular expression of colostrum till baby feeds effectively.
- First blood glucose estimation should be around four hours of age. All babies blood glucose levels fall immediately after birth. This normally rises significantly around 3 hours of age regardless of nutritional intake. Taking blood glucose readings before this time can lead to unnecessary supplements, repeated blood glucose levels and even unnecessary admissions to the neonatal unit.<sup>10</sup>
- At risk babies are vulnerable therefore regular monitoring of vital signs is crucial to identifying problems quickly and referred accordingly.
- Frequent documented monitoring is required of the baby's well-being and feeding. Use of local audit tools are necessary to evaluate these guidance and audit the prevalence and outcomes of hypoglycaemia in NHS Highland. (Appendix 4)
- At risk babies need frequent feeding to maintain blood glucose levels at least every 3 hours. Encourage feeding more frequently if baby shows signs it is willing.
- Pre-feed blood glucose levels are important for the at risk baby due to their impaired ability to utilise stored glucose or alternative fuels. Pre-feed blood glucose levels should be performed 3 hourly .Ongoing pre-feed blood glucose levels will indicate how well the baby is coping with intermittent feeding.

The agreed acceptable blood glucose level for an at risk baby should be maintained at

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- $\geq 2.6$ mmols/l. As long as blood glucose levels are maintained continue to feed 3 hourly with pre-feed blood glucose levels until 24 hours old.
- Post feed blood glucose is only necessary if the pre-feed blood glucose was  $<2.6$ mmols/l. All attempts should be made to breastfeed again or obtain colostrum before resorting to formula as a top up. Post-feed blood glucose levels should be repeated 1 hour after top up.
  - If blood glucose level between 1.6mmols/l and 2.5mmols/l breastfeed immediately or give expressed breast milk or formula if formula feeding. Check blood glucose in 1 hour. If blood glucose is still  $<2.6$ mmols/l inform Paediatrician or ANNP for lab blood glucose analysis. Give formula feed of 8-10mls/Kg whilst awaiting result.
  - If blood glucose  $<1.6$ mmols/l at any time or baby shows signs of hypoglycaemia. Inform the Paediatrician or ANNP immediately for laboratory blood glucose analysis and possible admission to the neonatal unit.
  - If a baby requires special care, the mother should be encouraged to express her breast milk as soon as possible. This will maximise mother's milk supply and provide adequate nutrition for her baby. Expressing should be encouraged via hand in first 24 hours and then via pump – pumping at least 8 times in 24 hours until the milk flow subsides should be encouraged at all times.

## 4. Good Principles

- Cold babies cannot utilise alternative fuel stores and might become hypoglycaemic, therefore encourage skin to skin contact at birth and thereafter to regulate temperature and encourage feeding.  
\*(Check temperature and review condition at each feed).
- Encourage and assist with correct positioning and attachment at the breast to ensure sufficient colostrum is obtained.
- The at risk baby who is clinically well requires feeding at least 3 hourly either by breast, EBM or formula( if formula-fed). NB allowing the baby to sleep for 3 hours may result in less than 8 feeds in 24 hours.
- Only supplement an 'at risk'-baby with formula if increased breastfeeding and expressed breast milk do not maintain the plasma glucose. Remember bedside blood glucose tests are a guide only and may be inaccurate in the low range, laboratory confirmation is therefore required. Supplements of formula, based on bedside blood glucose levels are sometimes unnecessary.

### Jitteriness

Various conditions give rise to a tremor which appears 'jittery' and the term is often used indiscriminately – it is not a definitive sign of hypoglycaemia. It is important to describe what it is not.

**Startle Reflex:** which is normal, occurs in response to stimulus and stops as the baby settles.

**Seizures:** tonic and clonic fitting movements are often rhythmic and characteristically occur in bursts and continue even when the baby is restrained.

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**Jitteriness:** Excessive repetitive movements of one or more limbs, which are unprovoked, and usually relatively fast. It is important to ensure that this movement is simply not a response to stimuli.<sup>4</sup>

## 5. Guidelines for babies in the postnatal ward that require supplementation for low blood sugars

During the last trimester of pregnancy, the fetus lays down stores in the form of carbohydrate and fat. In the healthy full term infant there are changes after birth in the hormones and enzymes that allow the energy-providing fuels such as glucose and fat to be released from these body stores. Fat is broken down in the liver to form other fuels like ketone bodies. These ketone bodies are important alternative fuels to glucose especially for the neonatal brain and protect the healthy term infant from the effects of the lowering of blood glucose which occurs in the first 2-3 days until feeding is established. The breastfed baby also inhibits insulin secretion, which helps sustain blood glucose levels. This process of release and utilisation of stored fuels after birth is called neonatal metabolic adaptation.

Colostrum comes in small amounts and has been shown to raise blood glucose concentrations and enhance the mobilisation of alternative fuels such as ketone bodies, as well as providing all the other benefits of breastfeeding. Colostrum should always be given first, with other fluids introduced only if clinically indicated.

If a baby requires a formula supplement for low blood glucose measurements, it should be given normal first stage whey based formula of the mother's choice. Specialised pre-term high calorie milks are designed for premature babies and may lead to extremes in blood sugar thus preventing babies using their natural ability to counter regulate alternative fuels.

Please remember to use a syringe or cup to supplement a breastfed baby and only after all attempts have been made to obtain breastmilk should formula be considered.

Supplements of colostrums/ebm or formula should be given as follows:-  
Volumes less than 5 mls via syringe.  
Volumes above 5 mls via cup primarily.

Breastfed babies should **not** be given the same amounts of formula as a formula fed baby.

If supplementary feeds are required in response to a low blood glucose level, sufficient infant formula or EBM should be given to achieve an acceptable rise i.e. 8-10/mls kg, increasing daily with a baby's age.

If BGL are consistently low this volume can be reviewed.

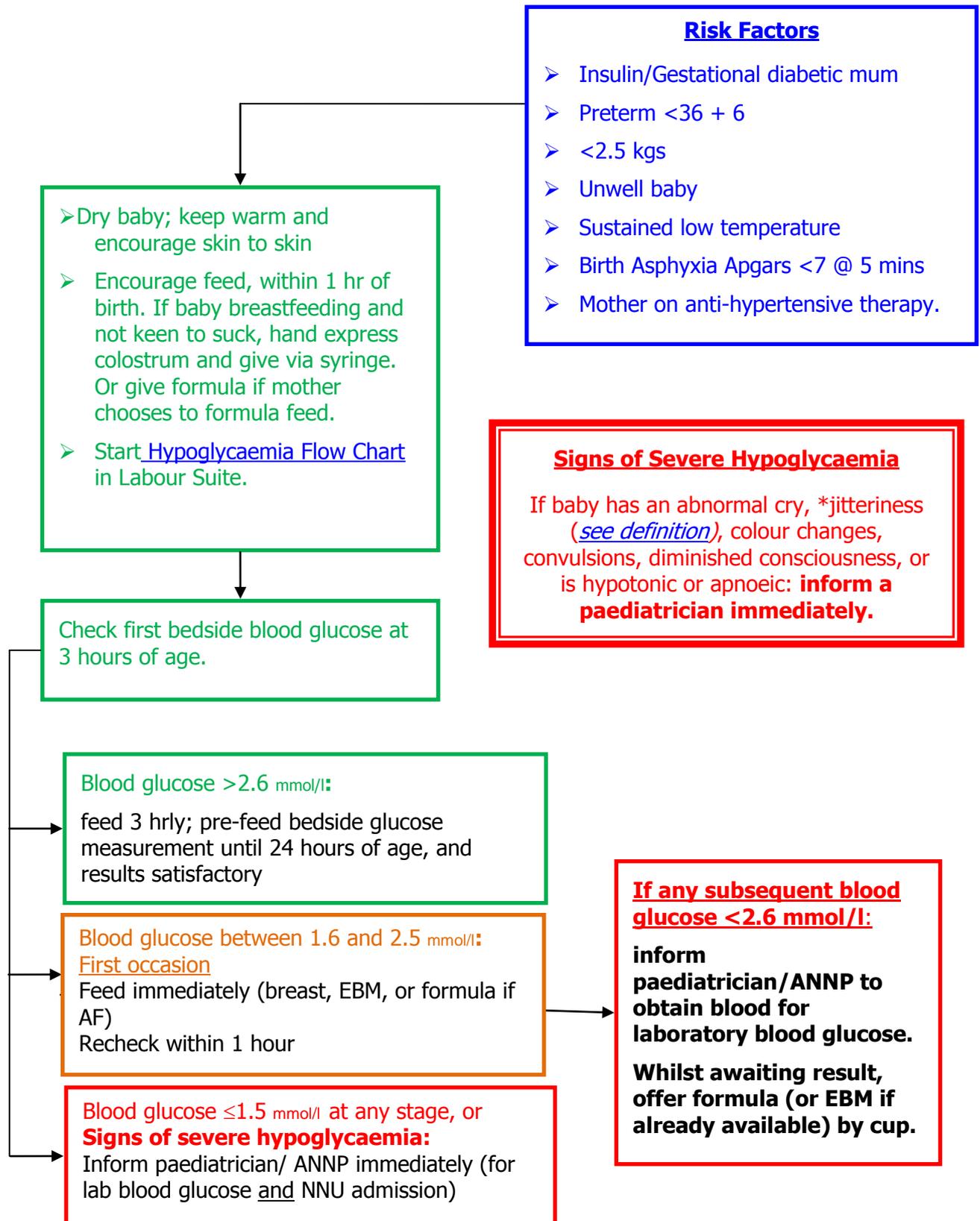
### Supplementation rates for formula fed neonates

Age	Recommended amount of formula in 24 hours if A/F fed
Delivery day	60 mls / kg/day
Day one	90 mls / kg/day
Day two	120 mls / kg/day
Day three	150 mls / kg/day

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# Appendix 1 Guideline for maternity staff, on the management of infants at risk of hypoglycaemia



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### Good Principles

- ♦ Cold babies cannot utilise alternative fuel stores and might become hypoglycaemic, so encourage skin-to-skin contact at birth and thereafter to regulate temperature and encourage feeding. (Check temperature and review condition at each feed).
- ♦ Encourage and assist with correct positioning and attachment at the breast to ensure sufficient colostrum is obtained.
- ♦ The “at risk baby” that is clinically well requires feeding at least 3 hourly either by breast, EBM or formula if A/F fed. Remember if you let a baby sleep for 3 hours, it will often take the mum 1 hour to feed it resulting in only 6 feeds in 24 hours.
- ♦ Only supplement an “at risk-baby” if increased breastfeeding and expressed breast milk do not maintain the plasma glucose. Remember that bedside blood glucose tests are a guide only and may be inaccurate in the low range. Laboratory confirmation is therefore required. Supplements based on bedside blood glucose readings are sometimes inappropriate.

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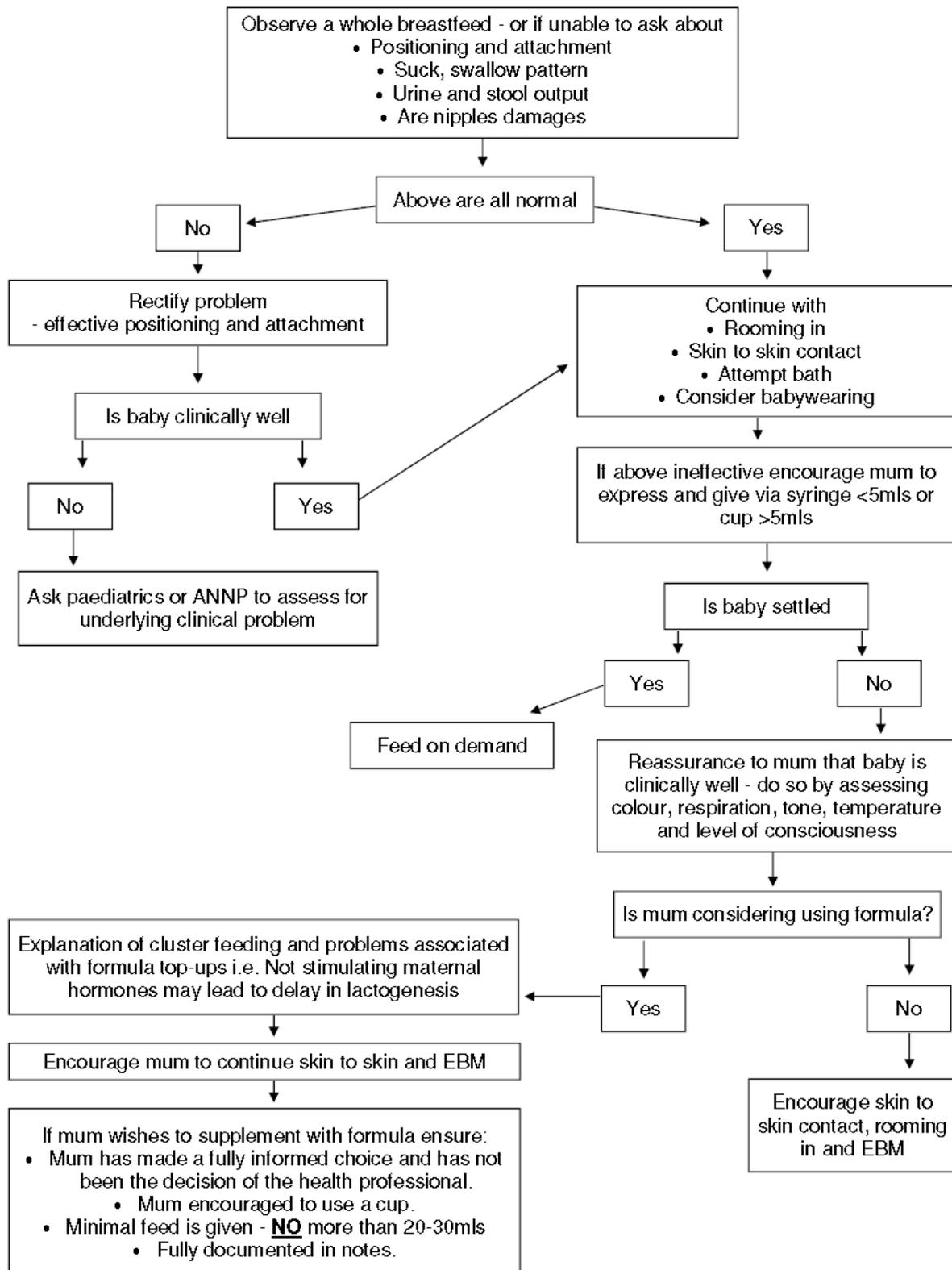
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## Appendix 2

Pathway for the healthy term baby who is unsettled or feeds frequently



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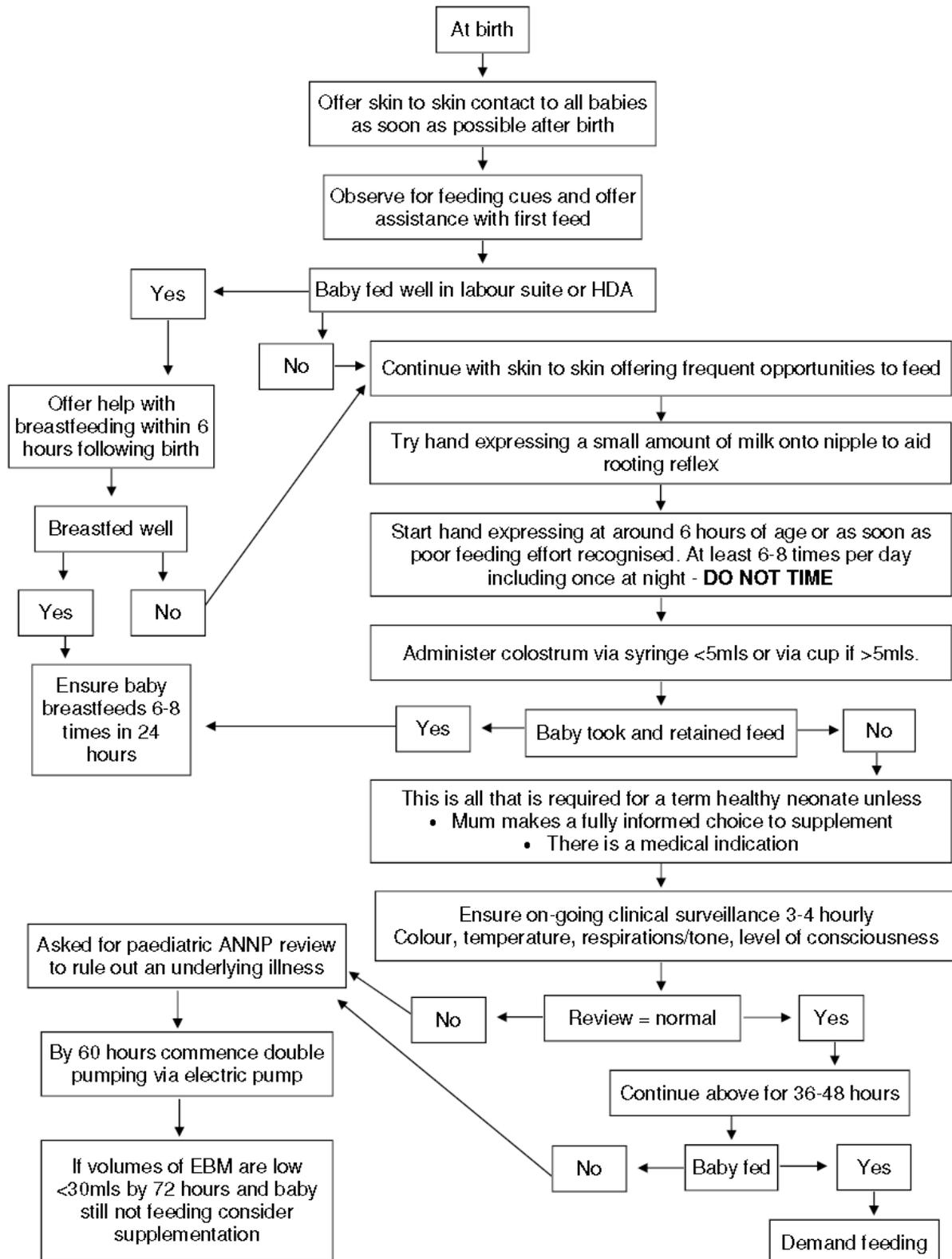
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## Appendix 3

Pathway for the healthy term baby who is reluctant to breastfeed.

Reluctant - term applied to newborn babies who are too sleepy to attach at breast or only take a few sucks.



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## Appendix 4

**POST-NATAL HYPOGLYCAEMIA CHART**      **DATE** \_\_\_\_\_

Reason on Protocol\* \_\_\_\_\_ Date of Birth \_\_\_\_\_

Preferred Feeding Method \_\_\_\_\_ Time of Birth \_\_\_\_\_

Name
DOB/CHI
Insert Sticker Here



FEED	1	2	3	4	5	6	7	8
DATE								
TIME								
T YPE OF FEED BREAST, FORMULA OR EBM? BOTTLE OR CUP? ANY TOP UP?								
PRE-FEED BEDSIDE BLOOD GLUCOSE								
POST-FEED BEDSIDE BLOOD GLUCOSE	ONLY IF PRE- FEED <2.6							
TEMPERATURE								
PAEDS CONTACTED? If So, TBG RESULT								

**FIRST CHECK**

Ensure baby is fed within first 2 hours

Check 1<sup>st</sup> glucose at 4 hours of age

\*if mother on antihypertensive therapy, complete details overleaf.

**THEREAFTER**

Blood Glucose >2.6mmol/l  
- feed 3 hourly with pre-feed blood glucose until 24h of age

Blood Glucose 1.6 - 2.5mmol/l (at any stage)  
- first occasion: Feed immediately (breast, EBM or formula)  
Recheck glucose 1 hour post-feed  
- any subsequent occasion: Inform Paeds/ANNP for TBG  
Offer formula feed via cup

Blood Glucose <1.5mmol/l  
- Urgent referral to Paediatrics/ANNP for TBG  
- Admission to SCBU

**COMING OFF THE PROTOCOL**

Tick reason for coming off protocol:

Normal blood sugars for 24 hours  
(If there are any low blood sugars in this period, then 3 consecutive normal blood sugars must be recorded after 24 hours of age.)

x 3 consecutive normal blood sugars after 24 hours of age

Date \_\_\_/\_\_\_/\_\_\_ Time: \_\_\_:\_\_\_

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POST-NATAL HYPOGLYCAEMIA CHART      DATE \_\_\_\_\_

ANTIHYPERTENSIVE THERAPY? SPECIFY DRUG:		DURATION (CIRCLE) <24 HRS: 24 HRS TO 7 DAYS: >7 DAYS
FURTHER FEEDING COMMENTS		
DATE & TIME	COMMENTS	

Prepared by David Hettle 2013. Owner: Philline van der Heide. Revised 18/8/14. Next review August 2015.

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