NEONATAL HYPOGLYCAEMIA GUIDELINES

The identification and management of neonatal hypoglycaemia on the postnatal ward.

An adaptation of the BAPM framework for practice

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Brief summary of Document:	The aims of this guideline are to safely manage babies at risk of hypoglycaemia, where possible to keep mothers and babies together, and to reduce the risk of brain injury.

Scope	This guideline is targeted at all healthcare professionals involved in the care of the infant for the first 48-72 hours after birth.

To be read in conjunction with:	1. Healthy term infant who is reluctant to feed 2. Guidelines for management of weight loss in Breast & Formula feeding 3. Babies at high risk of Hypoglycaemia 4. Low Apgars HIE symptomatic Hypoglycaemia

Owning Committee/ Group	Obstetric Guideline, Audit and Research Group

Reviews and Updates		
Version no:	Summary of Amendments:	Date Approved:
1	New Guideline	12/02/21

Glossary of Terms

Term	Definition
POCT	Point of Care Testing
BS	Blood Sugar
EBM	Expressed Breast Milk
BG	Blood Glucose

Keywords	Hypoglycaemia, infant of gestational diabetic, low blood sugar,

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1. Aim of Guideline

Full term, healthy babies have the ability to generate ketone bodies, which are used as alternative fuels for the brain. Therefore, there should be few occasions when their blood glucose concentration needs to be measured.

Studies have shown that asymptomatic hypoglycaemia has shown no neurodevelopmental abnormalities in term healthy babies.

The aim of this guidelines is to ensure blood glucose monitoring is not undertaken unnecessarily. Providing that staff and mothers are being proactive and there are no signs of hypoglycaemia, blood sugar levels do not need monitoring in healthy term babies.

2. Objectives

To identify babies at risk of hypoglycaemia

3. Scope

Focuses on three key areas:

A. Partnership with Parents
B. Early Identification
C. Regular Clinical Assessment

4. Introduction

Hypoglycaemia

Glucose is an essential nutrient for the brain. Abnormal low levels can cause an encephalopathy and have the potential to produce long term neurological injury. The level at which this potential for long term injury is reached is controversial. Two recent studies have fuelled controversy about this. Koh et al showed reversible disturbances in evoked potentials at glucose levels below 2.6 mmol/l in asymptomatic term babies. It is important to emphasise that this does not equate to permanent neurological injury. In preterm babies, Lucas et al found glucose levels below 2.5mmols/l were associated with worse neurodevelopmental outcome. Preterm babies have an impaired ability to produce ketone response to low glucose levels. In light of this lack of firm evidence arbitrary definition have to be used.

Healthy asymptomatic term babies:

There is a transient fall in blood glucose once the cord is clamped. During the first few days in healthy term babies there are physiological changes resulting in an increase in counter regulatory hormones such as glucagon, adrenaline, growth hormone and cortisol to orchestrate the recovery from transient hypoglycaemia.

Healthy term infants can utilise other cerebral fuels such as ketone bodies and lactate and are well adapted to withstand periods of low blood glucose. Therefore operational thresholds for hypoglycaemia may not be applicable to healthy term babies if they remain asymptomatic. There is evidence to suggest that healthy breast fed babies have lower blood glucose concentrations than those fed artificial formula, but no reason to suppose this is detrimental to outcome.

Healthy asymptomatic term infants should not be screened for hypoglycaemia

Definition

In **at risk** asymptomatic term infants Blood sugars should be maintained above 2 mmols/l. Blood glucose levels between 1.5 and 2 mmols/l should be acted on as detailed below and not tolerated for long (the effect of one feed).

Prevention

Prevention of hypoglycaemia is the therapeutic goal. There is a normal fall in the blood sugar level between 2-4 hours after birth and unless the baby is considered to be at very high risk for hypoglycaemia or showing signs of hypoglycaemia then BS' should not be done during this time.

Babies at high risk of hypoglycaemia need attention paid to the **early establishment of feeding** and the screening of blood sugar levels should be done. Babies of non-insulin dependent diabetic mothers and those babies identified to be at high risk of hypoglycaemia may be transferred to the postnatal ward (discuss with the senior staff and midwife involved) if otherwise well and have feed as soon as possible. Blood sugars need to be tested routinely (refer to flow chart 1). It is the babies who would not otherwise be admitted to SCBU who present a challenge of prevention.

Screening for hypoglycaemia can be performed using Point Of Care Testing (POCT). These are inaccurate at the lower end of the range tending to under read the true blood sugar. It is imperative that before treatment is commenced a sample is taken for lab confirmation. (Blood sugar less than 2 mmols/l to be checked by lab). Also if babies have blood sugars <1.5 mmols/l take extra samples for storage as further investigation may be needed to determine cause of hypoglycaemia.

This guidance focuses on three key areas:

a) Partnership with parents
b) Early identification of infants at risk and implementation of effective prevention strategies including early and regular feeding starting within the first hour after birth.
c) Careful and regular clinical assessment along with more accurate measurement of blood glucose using a hand held glucometer machine.

Hand held glucometers are used to guide the management of neonatal hypoglycaemia. All staff undertaking glucose measurements on the hand held glucometer must have received the appropriate Healthboard training and be appropriately trained in obtaining neonatal capillary blood sampling (Appendix 7).

Clinical assessments including the absence or presence of signs of symptomatic hypoglycaemia, must be regularly documented.

5. Identification of infants at risk

The following groups of infants are at risk of neurological sequelae of neonatal hypoglycaemia. Measures should be in place to identify them at birth for early milk/energy provision and monitoring of blood glucose concentration. Commence the following babies **Appendix 8: Hypoglycaemia pathway**

Intrauterine growth restriction (birth weight 2nd centile, Table 1), or clinically wasted. Plot the birth weight on the gestation specific growth chart and assess the centile. The table below gives a rough guide. Any < 2nd centile should be on hypoglycaemia pathway.

Table 1

Birth weight on 2nd centile		
Gestational age/weeks	Boys	Girls
37	2.10	2.00
38	2.30	2.20
39	2.50	2.45
40	2.65	2.60
41	2.80	2.75
42	2.90	2.85

Midwives are also at liberty to identify babies from the customized gap grow charts if the baby's birth weight is less than 2nd percentile predicted for that baby and the baby appears to have clinical evidence of growth restriction.

- **Infants of diabetic mothers.** In general all these babies must be managed using Appendix 8 with the exception of **a**ny infant of a diabetic mother who is clearly macrosomic or **> 98th centile for weight**. This latter group should be admitted to the neonatal unit promptly following a first feed as they are likely to have hyperinsulinism causing severe hypoglycaemia requiring IV fluids and would benefit from early infusion of dextrose.

Birth weight > 98% centile AND infant of diabetic mother		
Gestational age/weeks	Boys	Girls
37	3.8	3.7
38	4.1	3.9
39	4.3	4.1
40	4.5	4.3
41	4.6	4.4
42	4.7	4.5

- Infants of mothers taking beta-blockers in the third trimester and/or at time of delivery.
- Babies born less than 37 weeks gestation are at risk of hypoglycaemia. Energy provision and blood glucose monitoring should be planned as part of the care pathway for this group of infants.
- If a baby has a temperature of 36.5ºc at any time, the midwife should in the first instance place the baby skin-to-skin and re-check in 1 hour. If unable to place the baby skin-to-skin

consider using a heated mattress and dressing the baby appropriately. If after remedial actions have been taken and the temperature remains low then the baby should be offered a feed and paediatric review should be requested and the hypoglycaemia pathway commenced.

- Any baby with strongly suspected/ known sepsis.

- (There are also some rare conditions where the baby is at risk of hypoglycaemia eg Beckwith – Weidermann Syndrome, Turner syndrome, Costello Syndrome, Prader – Willi syndrome, Sotos syndrome). If such a syndrome is identified or suspected, manage using **flow chart 3.**

- Sometimes screening for hypoglycaemia and management using flow chart 3 is indicated by a family history of an inborn error of metabolism or other indication flagged up by a paediatrician / neonatologist.

In all the above situations please ensure that 40% dextrose gel is written up prophylactically on the 'as required medicines' part of the prescription record. The dose is 0.5mls/kg.

All such babies should also have a feeding chart /record, along with the blood glucose result and time of sample. (Appendix 2 & 3)

All babies on the pathway should be commenced on the Hypoglycaemia Obs chart and regular observations recorded, including presence of absence of signs of hypoglycaemia.

Parent Information (Appendix 6)

Provide parents with verbal and written information that explains why their baby is receiving extra support and blood glucose monitoring, how the likelihood of hypoglycaemia can be minimised, the signs that could indicate that baby is becoming unwell, and how to raise concerns about their baby's wellbeing or feeding pattern to staff. A HDUHB parent information leaflet is available on the intranet. Please ensure this is given to parents as early as possible.

Measurement of blood glucose concentration should be performed for any infant who has one or more of the following diagnoses or clinical signs:

- Perinatal acidosis (cord arterial or infant pH <7.1 and base deficit ≥ -12mmol/L)
- Cyanosis
- Apnoea
- Altered level of consciousness
- Seizures
- Hypotonia
- Lethargy
- High pitched cry

Abnormal feeding behaviour in babies on the pathway(not waking for feeds, not sucking effectively, appearing drowsy or lethargic, or constantly unsettled at the breast e.g. pulling off and getting angry when offered the breast), especially after a period of feeding well, may be indicative of hypoglycaemia. It should prompt a full clinical assessment and blood glucose measurement. Refer also to the generic reluctant feeder guideline.

Jitteriness defined as excessive repetitive movements of one or more limbs, which are unprovoked and not in response to a stimulus is common and is not by itself an indication to measure blood glucose. In an at risk baby it may be a sign of hypoglycaemia.

6. Management antenatal

Ensure mothers are given an antenatal hand expressing pack with all the information

7. Management of the baby after birth (Appendix 1)

Immediately after birth, the baby should be dried, covered and a hat put on. He/she should be placed in skin to skin contact with the mother to provide warmth and to facilitate the initiation of feeding. Ensure that ambient temperature is warm, the room is free from draughts, show mother safe positioning of the baby and commence observations. Regular observations include colour, tone, respiratory rate, heart rate, temperature, level of consciousness and signs associated with hypoglycaemia, recorded using the Hypoglycaemia Obs chart. Feeds should be documented on the appropriate chart with times and volumes, and blood glucose results recorded on a chart with the time of the sample carefully documented, and the signature of the person who did the test.

Babies born in MLU or in the community

Screen all babies at birth as described previously and examine for clinical evidence of growth restriction or clinical evidence of macrosomia as a result of hyperinsulinism. Take measures to keep baby warm and initiate an early feed. Babies on the pathway must be transferred out promptly to a hospital postnatal ward where regular blood glucose measurements can be undertaken. Use a transwarmer if necessary. Ensure a single feed and if available, a single bolus of Buccal Glucose Gel 40% prior to transfer.

Symptomatic hypoglycaemia may occasionally be seen in babies even with no identifiable risk factor and must be recognized by the staff caring for mother and baby. A bolus of dextrose gel and if possible a feed should be given prior to prompt transfer.

If a temperature is measured and it is between 36-36.5^{o}c then implement warming measures and give the baby a feed. Repeat the temperature measurement in 1 hour. If it is still below normal (defined as < 36.5 degrees C) then give a bolus of dextrose gel if available and a feed and arrange transfer.

Babies with abnormal feeding behaviour ie becoming excessively sleepy or not feeding will also require transfer. Again, a feed and a single bolus of 40% oral dextrose gel (0.5mls/kg) should be given prior to transfer.

Measurement of Blood Glucose (see Appendix 7)
Samples should be taken from a warm well-perfused heel by heel prick, or from a free flowing sample, using skin asepsis and patient comfort. Analyse the sample using Glucometer Machine on the postnatal ward. Record the result clearly on the chart. Use the result to manage the next stage.

7.1 Management (Flow chart 3)

Begin care pathway

- Ensure that baby is offered the breast within the first 60 minutes and assess the need for helping the mother with 1. Breastfeeding support, 2. Recognition of early feeding cues (rapid eye movements under the eye lids, mouth and tongue movements, body movements and sounds, sucking on a fist), and 3. Signs of effective attachment (Appendix 1 and Appendix 5)

- Assess and document feeding cues and feeding effectiveness at each feed. If the baby is not showing signs of effective feeding, encourage continuous skin to skin contact and teach the mother to hand express. Any colostrum expressed should be fed immediately to the baby, using a method that is best suited to the infant's capabilities and parent's preferences and consistent with local policy. Continue to express at least 8 – 10 times per 24 hour period until baby is feeding effectively and provide active feeding support until breastfeeding is established**. If no colostrum is available and after discussion with the mother, try expressing hourly, aiming for 5 mls colostrum in 3 hours. Consider use of dextrose gel or consider supplementing with term formula milk (10 mls/kg per feed) until colostrum is available.** Support to resume breast milk feeds as soon as possible.

- The first blood glucose measurement should be just before the second feed. In practice for the infant who is well this should be within 3 hours after delivery. (An infant who does not show any feeding cues within 3 hours, should prompt BG measurement by 3 hours and administration of a feed by syringe, cup or tube.
- Offer the breast in response to feeding cues as often as possible. Do not allow more than three hours to pass between feeds, until blood glucose measurements have been above 2.6mmol/L on three consecutive occasions. Continue feeding support until mother and midwife are satisfied that effective feeding is established.
- For women who choose to formula feed, offer 10mls/kg within the first hour and plan to feed 3 hourly. Aim to give at least 80 - 100mls/ kg /day in this group because formula milk has lower availability of cerebral alternative fuels. Feed responsively when blood glucose measurements have been above 2.6mmol/L on three consecutive occasions. If the baby does not show feeding cues, i.e. a reluctant feeder and has no signs of illness, refer to **reluctant feeder guideline.**

- Measure blood glucose immediately if there is **symptomatic hypoglycaemia**.

Signs include any of the following:

- Lethargy,
- abnormal feeding behaviour,
- high pitched cry,
- altered level of consciousness,
- any temperature measurement <36.^{o}C,
- hypotonia,
- seizures,
- apnoea,
- cyanosis.

Symptomatic hypoglycaemia is a medical emergency as if untreated it will lead to brain cell death.

Symptomatic hypoglycaemia should be followed immediately by measures to correct it (Buccal dextrose gel or IM glucagon 200 micrograms / kg up to a maximum of 1 mg as a single dose) escalate and admit to SCBU.

- Based on the result of the first blood glucose (BG) measurement, place the baby on one of the following care pathways:

- Blood glucose > 2.6 mmol/litre and no abnormal signs. **Continue pathway part one**
- Blood Glucose >2 to < 2.6mmol/L, and no abnormal signs. **Continue pathway part two**. Support ongoing breast feeding. If baby not breast feeding try expressing aiming for at least 5 mls colostrum in 3 hours, give dextrose gel and consider supplement with formula milk 5-10 mls per kg per feed (Appendix 1)
- Blood Glucose <1.6mmol/L, and /or clinical signs consistent with hypoglycaemia at higher Blood Glucose concentration. **Admit to neonatal unit promptly for hypoglycaemia workup and urgent IV dextrose.**

If at any time a midwife is not happy with the actions from the neonatal or paediatric team, she must discuss these directly with the responsible consultant and document this in the medical notes.

Hypoglycaemia pathway part three (Admit to SCBU)

If single blood glucose < 1 .6mmols/l, baby is symptomatic or there have been 3 blood glucose measurements of less than 2 mmol/l in the first 48 hours, or at discretion of neonatal team - follow pathway part three.

Request urgent paediatric review and give 40% buccal dextrose gel. Arrange immediate admission to the neonatal unit for consideration of hypoglycaemia screen, IV dextrose bolus and infusion (having given the oral dextrose gel first).

Give 40% buccal dextrose gel (0.5mls/kg) stat. Do not wait for hypoglycaemia blood screen prior to giving this.

Absolute indications for IV administration of dextrose and correction of hypoglycaemia are as follows

- ***A BG value <1.6 mmol at any time***
- ***Any signs / symptoms suggestive of hypoglycaemia and a single glucose value < 2.6 mmol/litre***
- ***A baby with HIE (on neonatal unit) should have glucose maintained >3 mmol/l***
- ***A baby who is thought to have hyperinsulinism should have glucose maintained > 3mmol/L***

Further care

Do not transfer babies with risk factors for impaired metabolic adaptation and hypoglycaemia to community care until you are satisfied that the baby is maintaining blood glucose levels >2.6mmol/L on at least three consecutive occasions and is feeding well. Infants at risk of hypoglycaemia should not be transferred to the community until they are at least 24 hours old.

Administration of buccal dextrose gel

Indications

- Blood glucose <2.6mmol/l in infant with no abnormal clinical signs
- Poor feeding
- Must be used in conjunction with a feeding plan
- Infants with symptoms of hypoglycaemia or BG < 1.6 mmol/ l may receive this ONLY as a temporary measure whilst arranging immediate admission to the neonatal unit
- Can be given in the MLU or community in infants at risk immediately prior to transfer into hospital

Dose and administration

- 200mg / kg (0.5 mls per kg) of 40 % dextrose gel
- Draw up using a 2.5 or 5 mls oral enteral syringe
- Dry oral mucosa gently with a gauze swab and gently squirt with syringe into the inner cheek and gently massage using latex free gloves

Any more than three doses should be discussed with the neonatal team. Can give up to six doses on postnatal ward.

Caveat

If given as a temporising measure for symptoms of hypoglycaemia the baby must be admitted to the neonatal unit even if when seen by the paediatrician / neonatologist the symptoms of hypoglycaemia have resolved.

8. Record Keeping

All documentation and plans must be recorded in baby's notes.

9. Auditable Standards

- Appropriate identification of infants deemed at high risk of neonatal hypoglycaemia
- Evidence of appropriate adherence to the hypoglycaemia pathway
- Appropriate use of buccal glucose gel for hypoglycaemic infants
- Monitoring of admissions to SCBU as a result of hypoglycaemia

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Appendix 1 – Feeding Management Chart

BOX 1

REVIEW

Check

- Colour
- Tone
- Alterness
- Maintain normal body temperature
- Normal urine/stools for age
- If any signs of illness refer to Paediatrician

BOX 2

PROACTIVE MANAGEMENT

- Ongoing observation
- Hand express, give EBM if not available continue expressing hourly)
- Ongoing skin contact/temperature maintenance
- If baby does not have a good 1st feed please continue giving EBM as many times as you can until recheck at 3 hrs

BOX 3

Discuss

- Positioning and attachment
- Skin to skin
- Rooming in/Bed sharing
- Teach hand expressing (8-10/24 hrs) and commence straight away
- Breastfed well (means actively sucked using the rhythmical suck/swallow pattern
- Document in mother's notes

Feeding cues

- Roofing
- Licking/sucking fingers
- Wriggling/hand movements
- Restlessness
- Rapid eye movement
- Mothers full breasts

BOX 4

Amount of supplementation will depend on EBM and how much EBM given already

- If supplementation (medically indicated) needed
- 1st 24 hours after birth 5-10mls per feed
- 2nd 24 hours after birth – 10-15mls per feed
- 3rd 24 hours after birth – 15-20mls per feed
- ALL MOTHERS SHOULD BE HANDEXPRESSING
- 8-10 times in 24 hours until baby established at breast
- Record in mothers notes – diagnosis, indication for supplementation and management plan by Paediatrician

BOX 5

Signs of Hypoglycaemia	
Irritability, tremors (jitterness*) Hypothermia Feeding poorly, particularly after feeding well Apnoea, tachypnoea, grunting Sudden pallor Abnormal cry (weak or high pitched) Apathy, lethargy, limpness Seizures	'Jitterness' is a rapid generalised symmetrical tremor of the limbs. It can be stopped by holding the baby and flexing the limbs. It is never accompanied by physiological changes e.g. raised heart rate or apnoea. In a term baby jitterness is often a benign finding. In an 'at risk' baby, remember to consider hypoglycaemia

Addressograph

Appendix 2 - Hypoglycaemia Observation chart

Reason ……..
Wt……Time of birth……..

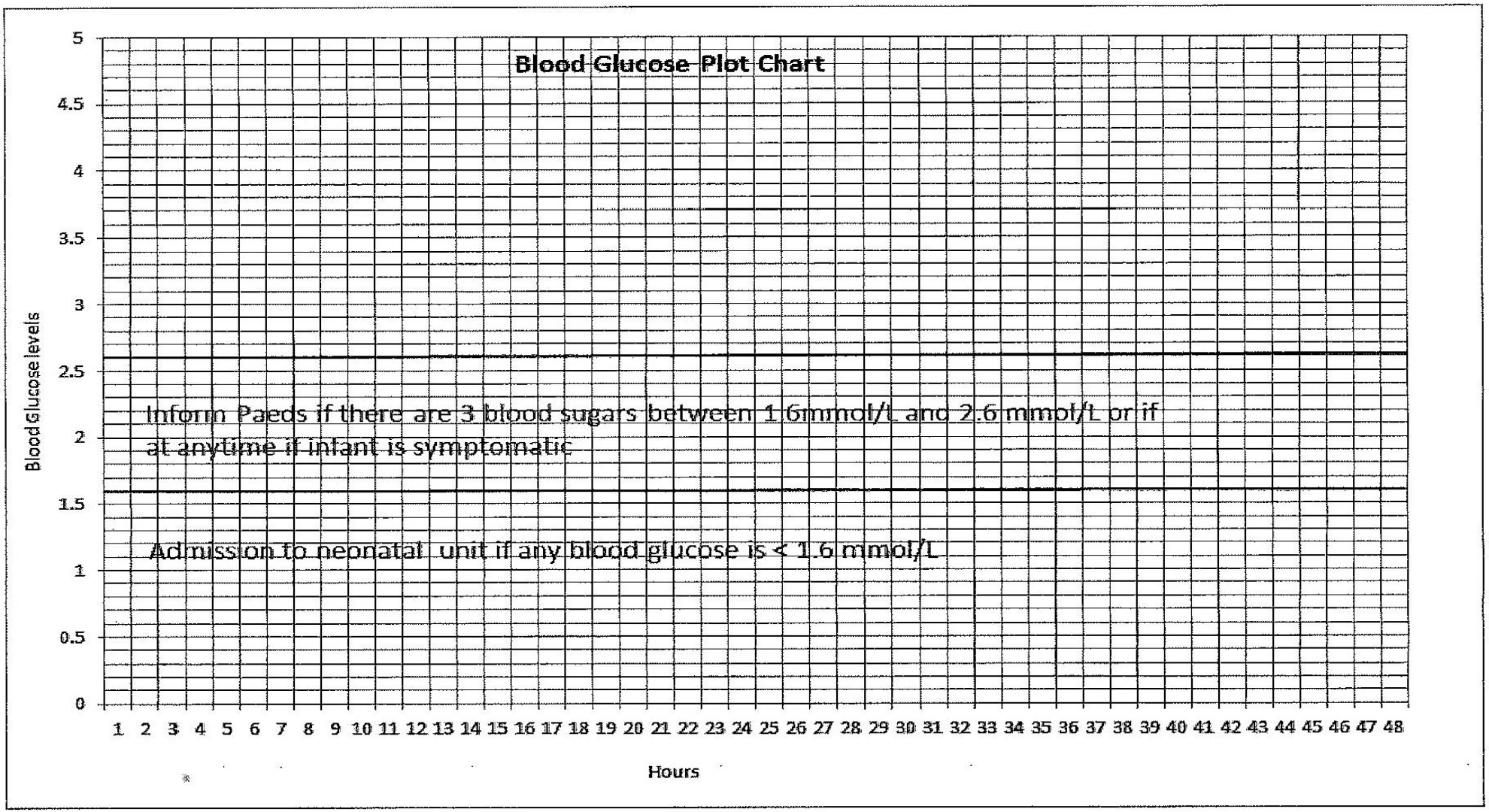
Please plot blood glucose level on the chart on the back and complete the Hypoglycaemia Obs Chart

Review:- Baby must be picked up during each review to assess tone correctly prior to feeds check

- Level of consciousness
- Tone
- Temperature
- Breathing pattern
- Colour

DATE AND TIME	SKIN TO SKIN	BLOOD SUGAR	LEVEL OF CONSCIOUSNESS ALERT AND RESPONSIVE DROWSY STUPOROSE AGITATED	COLOUR PINK/PALE/ JAUNDICED	TONE NORMAL / REDUCED / INCREASED	TEMP	HR	RESPS	FEED AMOUNTS BREAST / CUP / SYRINGE	BO	URINE	SIGNATURE

Appendix 3 – Blood Glucose Plot Chart
Date:



Appendix 4.1

Standard Operating Procedure for the Use of Glucose Gel for Hypoglycaemia in High Risk Infants on the Postnatal Ward

It is the responsibility of the nursing staff using this SOP to ensure that treatment with this medication is appropriate. **IF IN DOUBT SEEK FURTHER ADVICE BEFORE ADMINISTERING ANY MEDICATION**	
Clinical Condition	
Criteria for Inclusion	• Buccal Glucose must be used in conjunction with a feeding plan • Blood Glucose 1.4-2.5mmol/L in an infant with no abnormal signs • Infants >34+6 gestation and younger than 48 hours after birth • Blood glucose <1.4mmol/L in babies >35 weeks gestation whilst arranging urgent review
Criteria for exclusion	• Babies <35 weeks gestation • Babies >48 hours of age
Seek further advice	• Urgently if any clinical manifestations of hypoglycaemia • Discuss second dose with neonatal team • Request review for examination by neonatal team prior to third dose as per hypoglycaemia guideline

<table>
<tr><td>Description of treatment</td><td></td></tr>
<tr><td>Name of medicine</td><td>Glucose Gel 40%</td></tr>
<tr><td>Legal status of Medicine</td><td>GSL</td></tr>
<tr><td>Form</td><td>Gel</td></tr>
<tr><td>Strength</td><td>40%</td></tr>
<tr><td>Dosage</td><td>0.5ml/kg of 40% Buccal Glucose Gel
<table>
<tr><th>Weight of Baby (kg)</th><th>Volume of Gel (ml)</th></tr>
<tr><td>1.5-1.99</td><td>1ml</td></tr>
<tr><td>2.0-2.99</td><td>1.5ml</td></tr>
<tr><td>3.0-3.99</td><td>2ml</td></tr>
<tr><td>4.0-4.99</td><td>2.5ml</td></tr>
<tr><td>5.0-5.99</td><td>3ml</td></tr>
<tr><td>6.0-6.99</td><td>3.5ml</td></tr>
</table></td></tr>
</table>

Appendix 4.2

Route of administration	Buccal
Method of Administration	• Draw up correct volume of 40% glucose gel (Glucogel®) using a 2.5 or 5ml oral / enteral syringe • Dry oral mucosa with gauze, gently squirt gel with syringe (no needle) onto the inner cheek and massage gel into the mucosa using latexfree gloves • Offer a feed preferably breast milk, immediately after administering glucose gel • Repeat blood sugar measurement as per guideline
Frequency of administration	Up to 2 doses given at least 30 minutes apart per episode of hypoglycaemia
Duration of treatment	In babies < 48 hours of age
Total treatment quantity	Maximum of 6 doses in 48 hours **Up to 6 doses can be given over a 48hour period but any more than one dose should be discussed with the neonatal team and it is advisable for the baby to be examined before the 3rd dose is administered.**
Adverse reactions	None anticipated Document and report any witnessed side effects
Verbal advice for patient/carer	Discussion documented in patient notes
Follow up	As per medical assessment
Arrangements for referral for medical advice	Follow Hypoglycaemia guideline and refer accordingly
Records of administration for audit	Document in Patient Notes

Appendix 5

Effective Breastfeeding Check

OBSERVE BABY FEEDING ON THE BREAST	YES (√)	NO (√)
C – Baby held **C**lose to mother		
H – Baby's **H**ead able to tilt back		
I – Baby's head and body **in a straight line**		
N – Baby's Nose opposite the mothers **Nipple**		
Baby has wide open mouth with CHIN touching the breast first, with head tilted back		
More areola seen above the babies top lip than below the bottom lip (if areola seen)		
Baby has rounded cheeks		
Babies chin indenting the breast		
Rapid sucks followed by slow deep sucks with swallows		
Contented baby who stays on the breast continuing to demonstrate slow deep sucks and swallows for at least 15 minutes		
No nipple / breast pain for mother		
Check that mothers' nipple are round and not white, "pinched" or misshapen after a feed		

- If any ticks in the "NO" column, then support mum to adjust positioning and attachment, try skin to skin contact.
- If no improvement with attachment, then help mother with hand expressing and give baby expressed breast milk
- Observe baby's vital signs (temperature, colour, breathing, responsiveness)

Authors: Dr Jamie Evans, Dr Elisa Smit, Dr Cora Doherty, Sarah Rowley ANNP, Jane Gray, Judy Rogers, Allison Lewis
Reference number: 1
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APPENDIX 6

Patient Information Leaflet

Protecting Your Baby from Low Blood Glucose

What is Low Blood Glucose?

You have been given this leaflet because your baby is at increased risk of having low blood glucose (also called low blood sugar or hypoglycaemia). Babies who are small, premature, unwell at birth, or whose mothers are diabetic or have taken certain medication (beta-blockers), may have low blood glucose in the first few hours and days after birth, and it is especially important for these babies to keep warm and feed as often as possible in order to maintain normal blood glucose levels.

If your baby is in one of these "at risk" groups, it is recommended that they have some blood tests to check their blood glucose level. Extremely low blood glucose, if not treated, can cause brain injury resulting in developmental problems. If low blood glucose is identified quickly, it can be treated to avoid harm to your baby.

Blood Glucose Testing

Your baby's blood glucose is tested by a heel-prick blood test. A very small amount of blood is needed and it can be done while you are holding your baby in skin-to-skin contact. The first blood test should be done before the second feed and repeated until the blood glucose levels are stable. You and your baby will need to stay in hospital for the blood tests. You will know the result of the test straight away.

How to Avoid Low Blood Glucose

- **Skin-to-Skin Contact**
  Skin-to-skin contact with your baby on your chest helps keep your baby calm and warm and helps establish breastfeeding. During skin-to-skin contact your baby should wear a hat and be kept warm with a blanket or towel

- **Keep Your Baby Warm**
  Put a hat on your baby for the first few days while he/she is in hospital. Keep your baby in skin contact on your chest covered with a blanket and look into you babies eyes to check his / her well-being in this position, or keep warm with blankets if left in a cot.

- **Feed as Soon as Possible After Birth**
  Ask a member of staff to support you with feeding until you are confident, and make sure you know how to tell if breastfeeding is going well, or how much formula to give your baby.

- **Feed as Often as Possible in the First Few Days**
  Whenever you notice "feeding cues" which include rapid eye movements under the eyelids, mouth and tongue movements, body movements and sounds, sucking on a fist, offer your baby a feed. Don't wait for your baby to cry – this can be a late sign of hunger.

- **Feed for as Long, Or as Much, As Your Baby Wants**
  To ensure your baby gets as much milk as possible

- **Feed as Often as Baby Wants, But Do Not Leave Your Baby More Than 3 Hours Between Feeds.**
  If your baby is not showing any feeding cues yet, hold him/her skin-to-skin and start to offer a feed about 3 hours after the start of the previous feed.

- **Express Your Milk (Colostrum)**
  If you are breastfeeding and your baby struggles to feed, try to give some expressed breast milk. A member of staff will show you how to hand express your milk, or watch the UNICEF hand expression video (search "UNICEF hand expression"). If possible, it is good to have a small amount of expressed milk saved in case you need it later, so try to express a little extra breast milk in between feeds. Ask your midwife how to store your expressed milk.

  Don't hesitate to tell staff if you are worried about your baby if your baby appears to be unwell, this could be a sign that they have low blood glucose.

  As well as doing blood tests, staff will observe your baby to check he / she is well, but your observations are also important, as you are with your baby all the time so know your baby best. It is important that you tell staff if you are worried that there is something wrong with your baby, as parents' instincts are often correct.

The following are signs that your baby is well:

- **Is Your Baby Feeding Well?**
  In the first few days your baby should feed effectively at least every 3 hours, until blood glucose is stable, and then at least 8 times in 24 hours. Ask a member of staff how to tell if your baby is attached and feeding effectively at the breast, or how much formula he / she needs. If your baby becomes less interested in feeding than before, this may be a sign they are unwell and you should raise this with a member of staff.

- **Is Your Baby Warm Enough?**
  Your baby should feel slightly warm to touch, although hands and feet can sometimes feel a little cooler. If you use a thermometer the temperature should be between 36.5°C and 37.5°C inclusive.

- **Is Your Baby Alert and Responding to You?**
  When your baby is awake, he/she will look at you and pay attention to your voice and gestures. If you try to wake your baby, they should respond to you in some way.

- **Is Your Baby's Muscle Tone Normal?**
  A sleeping baby is very relaxed, but should still have some muscle tone in their body, arms and legs and should respond to your touch. If your baby feels completely floppy, with no muscle tone when you lift their arms or legs, or if your baby is making strong repeated jerky movements, this is a sign they may be unwell. It can be normal to make brief, light, jerky movements. Ask a member of the team if you are not sure about your baby's movements.

- **Is Your Baby's Colour Normal?**
  Look at the colour of the lips and tongue – they should be pink.

- **Is Your Baby Breathing Easily?**
  Babies' breathing can be quite irregular, sometimes pausing for a few seconds and then breathing very fast for a few seconds. If you notice your baby is breathing very fast for a continuous period (more than 60 breaths per minute), or seems to be struggling to breathe with very deep chest movements, nostrils flaring or making noises with each breath out – this is not normal.

  Who to call if you are worried:
  - In hospital, inform any member of the clinical staff.
  - At home, call your community midwife and ask for an urgent visit or advice.
  - Out of hours, call NHS 111 or [local number for urgent assessment]
  - If you are really worried, take your baby to your nearest Paediatric A&E or dial 999.

What Happens If Your Baby's Blood Glucose Is Low?

If the blood glucose test result is low, your baby should feed as soon as possible and provide skin-to-skin contact. If the level is very low the neonatal team may advise urgent treatment to raise the blood glucose and this could require immediate transfer to the Neonatal Unit. Another blood glucose test will be done before the next feed or within 2-4 hours.

If you are breastfeeding and your baby does not breastfeed straight away, a member of staff will review your baby to work out why. If he / she is happy that your baby is well, s/he will support you to hand express your milk and give it by oral syringe / finger / cup / spoon. If your baby has not breastfed, and you have been unable to express any of your milk, you will be advised to offer infant formula.

In some hospitals the team may prescribe a dose of dextrose (sugar) gel as part of the feeding plan because this can be an effective way to bring your baby's glucose level up. If you are breastfeeding and advised to give some infant formula, this is most likely to be for one or a few feeds only. You should continue to offer breastfeeds and try to express milk as often as possible to ensure your milk supply is stimulated.

Very occasionally, if babies are too sleepy or unwell to feed, or if the blood glucose is still low after feeding, he / she may need to go to the Neonatal Unit / Special Care Baby Unit. Staff will explain any treatment that might be needed. In most cases, low blood glucose quickly improves within 24-48 hours and your baby will have no further problems.

Going Home with Baby

It is recommended that your baby stays in hospital for 24 hours after birth. After that, if your baby's blood glucose is stable and he / she is feeding well, you will be able to go home. Before you go home, make sure you know how to tell if your baby is getting enough milk. A member of staff will explain the normal pattern of changes in the colour of dirty nappies and number of wet/dirty nappies.

For further information, if you are breastfeeding, see 'How you and your midwife can recognise that your baby is feeding well' (Search 'UNICEF Baby Friendly assessment tool'). It is important to make sure that your baby feeds well at least 8 times every 24 hours and most babies feed more often than this.

There is no need to continue waking your baby to feed every 2–3 hours as long as he / she has had at least 8 feeds over 24 hours, unless this has been recommended for a particular reason. You can now start to feed your baby responsively. Your midwife will explain this.

If you are bottle feeding, make sure you are not overfeeding your baby. Offer the bottle when he / she shows feeding cues and observe for signs that he / she wants a break. Don't necessarily expect your baby to finish a bottle – let him / her take as much milk as he/she wants.

Once you are home, no special care is needed. As with all newborn babies, you should continue to look for signs that your baby is well, and seek medical advice if you are worried at all about your baby

Appendix 7

STANDARD OPERATING PROCEDURE

Heel prick sampling in Neonates

Introduction

Heel/finger prick sampling can be used to obtain a capillary blood sample from neonates. The sample may be used for a range of blood tests.

Capillary blood collection is the preferred method of blood sampling for neonates to ensure that they experience minimal discomfort and to reduce the risk of excessive tissue damage.

1. SAMPLING PROCEDURE

Equipment

- Blood test request form – with exception for Blood glucose, newborn screening and peripheral gases where Hospital ID label is required
- Clean gloves and personal protective equipment
- Clean tray to hold equipment
- Appropriate lancet for size of the neonate
- Relevant neonatal blood collection bottles, capillary tube or blood collection card
- Capillary tube capes, metal flee and magnet (if required) for blood gases
- Glucose monitoring equipment
- Sterile gauze swab x 1
- Sterile water
- Cotton wool
- Sharps disposal box
- Sucrose for neonate
- Dummy if baby uses one

Poor peripheral perfusion does not permit successful capillary sampling

- The patient should be identified as per Positive Patient Identification Policy and a full explanation of the procedure should be given to the parents to ensure their consent is obtained as per Policy for consent to examination or treatment and documented in hospital record
- Explain the procedure to parents
- Assemble equipment
- Wash hands thoroughly, put on disposable plastic apron and non-sterile gloves as per ANTT guidelines. Appropriate personal protective clothing should be worn (e.g. gloves, apron)
- Examine the heel. Maintain warmth of the chosen puncture site
- Wrapping of the site if necessary i.e. cover for 3-5 minutes with small blanket may increase skin temperature prior to sampling. To ensure blood vessels are dilated thus accelerating blood flow and reducing the difference between the arterial and venous gas pressures (Peters 2017)

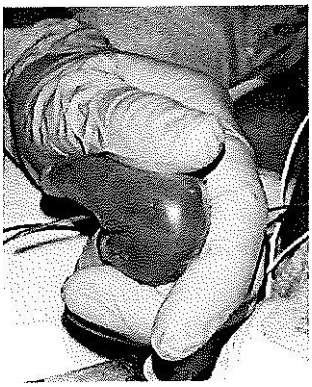
Warm skin will increase capillary blood flow by 7 times and prevent the need for massaging / milking the puncture site, thus avoiding the risk of skin contamination and haemolysis (Radiometer 2008a, 2008b, Centre for Phlebotomy Education 2009)

A cool, poorly perfused puncture site will provide inaccurate results (Hazinski 2013)

- The heel should be cleaned with sterile water and gauze. Allow the area to dry. Alcohol impregnated wipes should not be used, due to absorption and drying to the skin, association with chemical burns in preterm infants, minimising chemical exposure in the newborn and injury to delicate/healing tissue
- Safely position the newborn either with a parent/carer or in the cot
- Administer pain relief **(but not for hypoglycaemic babies)** i.e. 24% sucrose solution for neonates. To minimise pain and distress. Sucrose via the intra-oral route has been demonstrated to have evidence based analgesic actions for minor invasive procedures in neonates. The sweetness of sucrose appears to elevate pain thresholds via endogenous opioid pathways and result in decreased crying in the infant. Sucrose last approximately 3-5 minutes with a peak action at 2 minutes. (Kassab et al. 2012, Stevens et al. 2013, Hockenberry et al. 2017). If possible encourage breastfeeding or give EBM/bottle feed or skin to skin contact for pain relief

Choose the appropriate site for blood sampling. If the neonate is requiring numerous heel pricks for sampling ensure that alternate heels are used and that the heel is free from previous potential injury.

Keeping the dominant hand free to carry out the procedure, hold the baby's heel firmly and in your non dominant hand, hold the ankle with index and middle finger, and use the other fingers to steady the baby's leg. Partly encircle the baby's heel with thumb. Lateral and medical planter surfaces of the heel are the only acceptable sites in the neonate / infant.



- Gently apply pressure until blood drop appears. Excessive squeezing can cause trauma and bruising to the tissues and scraping and squeezing may initiate haemolysis of the blood. This can result in a poor sample being obtained which will require repeating.
- **Wipe away the first drop of blood with a gauze swab**, whilst holding the infants' heel and allowing blood drop to hang. The first drop of blood is often contaminated with tissue fluid, containing high

potassium levels which could identify inaccurate blood results. It also may cause an erroneous low pC02. (Merindino and Wessing 2006, Radiometer 2008b).Other capillary tubes may not have sufficient heparin to prevent sample clotting (Radiometer 2008a, 2008b)

- Whilst maintaining grip, hold the heel and allow the foot to hang down to aid blood flow and gently compress the heel to allow the blood collect in globules. Touch the blood droplet with the capillary tube or collect the droplets in a blood bottle or on a blood spot screening card. Following each drop slightly release the heel to allow it to refill. Continue to compress and relax grip on the heel to collect sufficient sample DO NOT SQUEEZE If the blood flow stops prior to completing the blood sample another heel puncture should be carried out.
- Ensure that correct volume obtained in relevant neonatal blood as under filled bottles have a high concentration of additives which may affect results

Post procedure

- Apply pressure to the puncture site using gauze, until the bleeding has stopped
- Avoid use of adhesive dressings. Adhesive dressings keep the area moist and increase the risk of infection. They can also result in epidermal stripping in the neonates, upon removal (American Association of Respiratory Care 2001)
- Dispose of all sharps, clinical waste. Remove gloves. Perform thorough hand hygiene
- Ensure samples are properly labelled, mislabelling of specimens can lead to incorrect diagnosis, therapy and treatment
- Document procedure including date, time, site, infant tolerance and any complications as per Clinical record keeping policy to ensure safe practice, continuity of care and maintain accountability
- Record the blood results in the appropriate nursing record sheet and report any abnormalities to the medical team.

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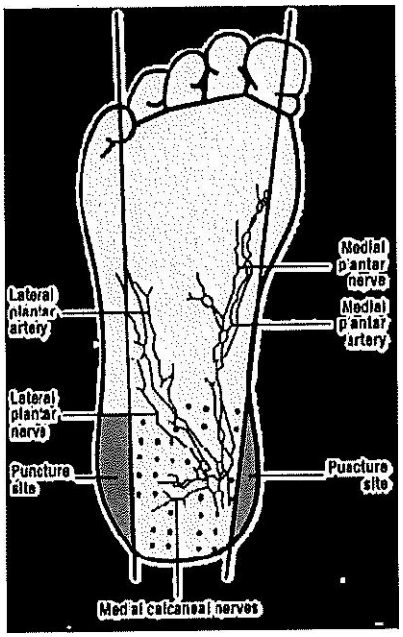
Heel lancing should be limited to the medial and lateral borders of the heel (please see diagram below).

In preterm infants, who undergo many repeated capillary blood samples during the course of their care, the close clustering of puncture sites may lead to significant trauma and tissue injury over time.



Appendix 8 – HYPOGLYCAEMIA PATHWAY HIGH RISK BABIES

ADDRESSOGRAPH

Mothers on beta blockers

Weight < 2.5Kg SGA <2nd Cent

Gestation <37 wks

Infant of diabetic mother

Temperature <36.5°C* See page 6/7

Diabetic & BWC >98th Admit to SCBU

Severe asphyxia PH 7.0 Or below

Step 1
At birth

Dry, Keep warm, initiate skin to skin. Initiate breast feeding by 30-60 mins. If baby not interested or the feed is ineffective supplement:
1. Breastfeeder – EBM 3mls in 3 hours
2. A/F – 10mls/kg

Please continue to feed baby – don't wait for 3 hours

TIME FIRST FEED…….Has baby fed effectively? YES – continue NO refer box 1, 2, 3 commence hand expressing.

Step 2

3 HOURS FROM 1st FEED

Time …… **Pre feed blood sugar** …… mmol/L **Temperature** ……..°C **36.5-37.5**

Pathway 1

Blood glucose >2.6 mmol/l

Continue feeds 3 hourly

Recheck blood glucose 3 hourly until 3 pre feed sugar >2.6 mmol/l

Three consecutive blood glucose >2.6 mmol completes the hypoglycaemia pathway regardless of the feeding interval

Pathway 2

BM>2 and <2.6 check box

Give breastfeed as soon as possible. If breast feeding ineffective (see effective feeding checklist) give EBM/colostrum (as much as can be expressed) or formula up to 10mls/kg/feed. Administer buccal dextrose (see Appendix 4 for dose).
Recheck Blood Glucose in 1 hour (post feed).

<2.6 Pathway 1

BM>2 and <2.6 mmol – Paeds review – Send blood to the lab for blood glucose

Do not leave for any longer than 3 hours between feeds

Pathway 3

Blood sugar <2

Buccal dextrose gel x 1 dose. Urgent paediatric review while waiting send blood to the lab for glucose.
Admit to SCBU if symptomatic.
Recheck Blood Glucose in 30 mins

<2.6 mmol/l

Admit to SCBU

Please record all obs and blood glucose on Hypoglycaemia obs chart and blood glucose plot chart

Birth weight on 2nd centile / kg		
Gest age/weeks	Boys	Girls
37	2.10	2.00
38	2.30	2.20
39	2.50	2.45
40	2.65	2.60
41	2.80	2.75
42	2.90	2.85