Clinical Guideline IDENTIFICATION AND MANAGEMENT OF NEONATAL HYPOGLYCAEMIA

SETTING	St Michael's Hospital (STMH): all areas of maternity services, neonatal unit, and community midwifery settings
FOR STAFF	All healthcare professionals involved in the care of infants during the first 48 hours after birth
PATIENTS	Newborn infants born \geq 34 weeks gestation, at risk of/with hypoglycaemia in the first 48 hours after birth, and their families.

GUIDANCE

Aims:

- Appropriately screen infants at risk of hypoglycaemia in order to detect pathology and prevent long term adverse effects;
- Reduce separation of mothers and healthy newborns;
- Facilitate breastfeeding.

Key Practice points:

This guideline is only applicable to infants in the first two days of life. Any infant found to have hypoglycaemia who is over 48 hours of age should be immediately referred to a neonatologist/paediatrician for a full assessment.

Current evidence suggests that lower levels of blood glucose can be tolerated in newborn infants compared with normal levels for children and adults. The most significant variable is whether the infant appears **well or unwell** at the time of the low blood glucose level.

Lower blood glucose levels are tolerated in newborn (<48h of age) infants who are otherwise well. Infants receiving critical care of with suspected or confirmed endocrine disorder require discussion with the responsible consultant as blood glucose targets and intervention thresholds may be higher in this group.

All staff involved in the care of infants in the postnatal period are required to have the skills to recognise a potentially unwell baby and seek appropriate help.

Symptoms of hypoglycaemia in newborn infants:

- Lethargy
- Abnormal feeding behaviour, especially after a period of feeding well
- High pitched cry / irritability
- Altered level of consciousness
- Hypotonia
- Seizures
- Hypothermia (<36.5°C) not attributed to environmental factors
- Cyanosis
- Apnoea

Infants who appear clinically unwell should have an immediate blood sugar and set of NEWTT observations taken, and be reviewed urgently by a member of the neonatal team. (Neonatal tier 1 bleep: 2934, Neonatal tier 2 bleep: 2935)

Infants are managed according to this guideline if they are identified as having a particular **risk of hypoglycaemia**, and/or have **confirmed hypoglycaemia**, regardless of risk factors, using the below criteria. flowcharts A, B and C are provided to outline care pathways as appropriate.

Confirmed hypoglycaemia is defined as:

- 1. A value < 1mmol/L at any time
- 2. Baby with abnormal clinical signs a single value of < 2.5mmol/L
- 3. Baby at risk but well, with 2 consecutive measurements 1-1.9mmol/L ▷ refer to flowchart B

 refer to <u>flowchart C</u>
 refer to <u>flowchart C</u>
 refer to <u>flowchart B</u> (after one measurement)

University Hospitals Bristol and Weston

(Thresholds for intervention as defined by BAPM 2017)

Infants at risk of hypoglycaemia:

- > **Preterm** infants born \geq 34 36+6 weeks gestation
- ➤ Term infants with intrauterine growth restriction (birthweight ≤ 2nd centile see appendix 1) or clinically wasted
- Infants of mothers with diabetes (all types)
- Infants of mothers taking beta blockers in the third trimester and/or at the time of delivery
- > Cord pH < 7.1 and/or base deficit \geq -12mmol

If these infants are well, manage according to flowchart A

These infants should have postnatal care on transitional care.

When a neonatologist should perform a diagnostic hypoglycaemia blood screen:

- 1. A baby with a blood glucose value < 1mmol/L at any time
- 2. A baby with abnormal clinical signs and a single value of < 2.5mmol/L
- 3. A baby with more than 2 measurements < 2mmol/L in 48 hours

Transient hypoglycaemia, defined as one measurement of 1 - 1.9mmol/l within the first 48h after birth, in an infant with no abnormal signs, who is feeding effectively, does **not** require investigation.

Further practice points:

- All infants managed on this guideline should be monitored with a NEWTT chart.
- Blood glucose levels should <u>not</u> be routinely taken in the first 2 hours after birth in a <u>well</u> baby, regardless of risk factors.
- Infants born at term, with a birth weight above the second centile for gestation, with no additional risk factors, do not need routine blood glucose monitoring and will have routine postnatal care.
- Offer feeds 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 2mmol/l on two consecutive occasions. (Also refer to flowchart A regarding enhanced care, and further blood glucose monitoring, for infants born <37 weeks.) Continue feeding support for a minimum of 24 hours and until mother and staff are satisfied that effective feeding is established.
- Infants born at < 34 weeks gestation and/ or with a birthweight < 1.5 Kg should be reviewed by a senior neonatologist and considered for admission to the neonatal unit.
- Infants with dysmorphic features should be reviewed by a neonatologist within the first hour of birth. They should be managed as per flowchart A if they are suspected of having a clinical syndrome putting them at risk of hypoglycaemia. If hypoglycaemia develops these infants should be admitted to the neonatal unit and specialist clinical advice sought.
- Jitteriness, defined as excessive repetitive movements of one or more limbs, which are unprovoked and not in response to stimulus, is common, and not in isolation an indication to measure blood glucose.

Infants who are reluctant to feed:

- All infants should receive pro-active feeding support, regardless of risk factors.
- Term infants with or without risk factors for hypoglycaemia:

Refer to Trust Clinical Guideline "Infant Feeding Management for Term, Healthy Babies". Reluctant feeding is common behaviour for many healthy term babies in the first 24-48 hours of life. Practitioners should take care to perform a full assessment in order to differentiate between a well baby who is reluctant to feed (does not show feeding cues or successfully feed effectively), versus a baby whose feeding pattern and/ or behaviour suggests an abnormal clinical state due to illness.

In the absence of risk factors for hypoglycaemia, these babies do <u>not</u> require routine blood glucose monitoring or transfer to transitional care, unless, as part of a full assessment there are concerns that feeding behaviours may indicate an abnormal clinical state.

• Preterm infants:

Manage on transitional care. These infants require careful assessment of feeding effectiveness and are more likely to require support with nasogastric feeding - discuss with the neonatal team and transitional care midwife in charge.

<u>Supporting breastfeeding:</u>

If a breastfed baby is not showing signs of effective feeding encourage continuous skin-toskin contact and teach the mother to hand express. Any colostrum expressed should be fed immediately to the baby, with no minimum volume. If it is not possible to obtain <u>any</u> colostrum, reassure the mother, and continue skin to skin with frequent attempts to hand express. If the baby has risk factors for hypoglycaemia, carefully consider, after thorough discussion with the mother, supplementing with a small volume of formula, until colostrum is available. Support exclusive breast milk feeds as soon as possible. Prolonged skin to skin in a laid back nursing position will stimulate the baby to use innate abilities and also help his/her mother recognise early feeding cues to utilise every opportunity to encourage a feed.

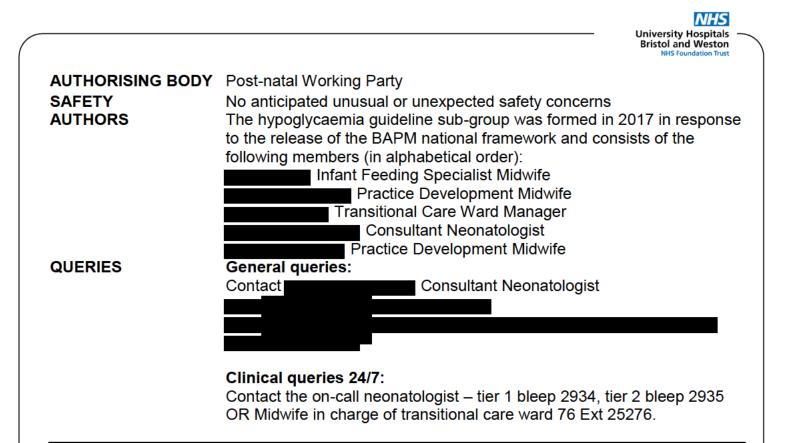
 Infants who appear clinically unwell should have an immediate blood sugar and set of NEWTT observations taken, and be reviewed urgently by a member of the neonatal team.

How to monitor blood glucose levels

- UHB ward glucometers conform to the required standard for accurate testing of newborn blood sugar above the level of 2 mmol/L.
- Samples should be taken from a warm, well perfused heel by heel prick following aseptic precautions.
- All levels < 2 mmol/L must be double checked with a blood gas on the NICU analyser but do not delay management.

Care pathways and tools: pages 6-14

Flowchart A:	<u>Risk of hypoglycaemia</u> : management of <i>asymptomatic</i> infants <u>></u> 34 weeks	Page 6
Flowchart B:	Threatened or confirmed hypoglycaemia: management of asymptomatic infants with blood glucose 1-1.9mmol/L	Page 7
Flowchart C:	Confirmed significant hypoglycaemia: management of infants who are symptomatic and/or with blood glucose <1mmol/L	Page 8
Appendix 1:	Identification of infants at risk of hypoglycaemia: page for display in clinical areas	Page 9
Appendix 2:	Identification of hypoglycaemic infants: page for display in clinical areas	Page 10
Appendix 3:	Use of glucose gel according to flowcharts B or C	Page 11
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RELATED DOCUMENTS	Identification and management of neonatal hypoglycaemia in infant (BAPM 2017) Infant Feeding Management for Term Healthy Babies Clinical (UH Bristol 2018) Immediate Care of the Newborn Clinical Guideline (UH Bristo NEWTT: Newborn Early Warning Trigger and Track (BAPM 2 Patient Information Leaflet: Protecting your baby from low blo- (UHBristol 2018) Reducing harm leading to avoidable admission of full-term ba neonatal units ('Reducing Term Admissions' / 'Atain') (NHS In 2017)	Guideline <u>I 2018)</u> 015) od glucose <u>bies into</u>



References

British Association of Perinatal Medicine (2015) NEWTT: Newborn Early Warning Trigger and Track. London: British Association of Perinatal Medicine.

British Association of Perinatal Medicine (2017) Identification and Management of Neonatal Hypoglycaemia in the Full Term Infant – A Framework for Practice. London: British Association of Perinatal Medicine.

Liverpool Women's NHS Foundation Trust (2017) Identification and Management of Neonatal Hypoglycaemia in Term and Late-preterm (≥ 34 weeks) Infants. Liverpool: Liverpool Women's NHS Foundation Trust.

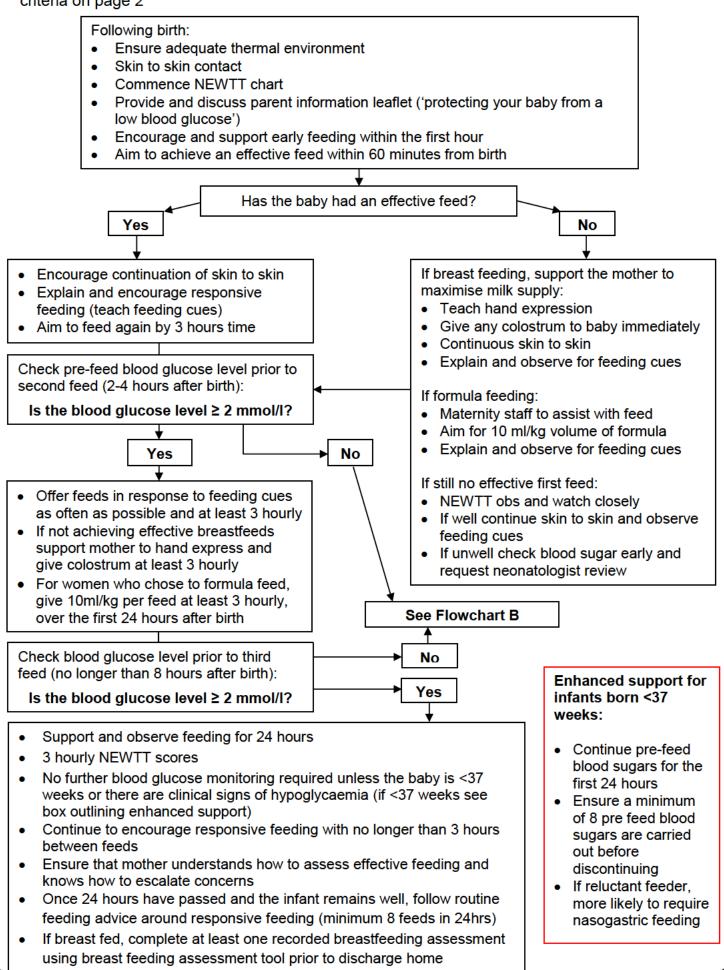
Liverpool Women's NHS Foundation Trust (2017) Liverpool Women's Hospital Neonatal Hypoglycaemia Pathway. Liverpool: Liverpool Women's NHS Foundation Trust.

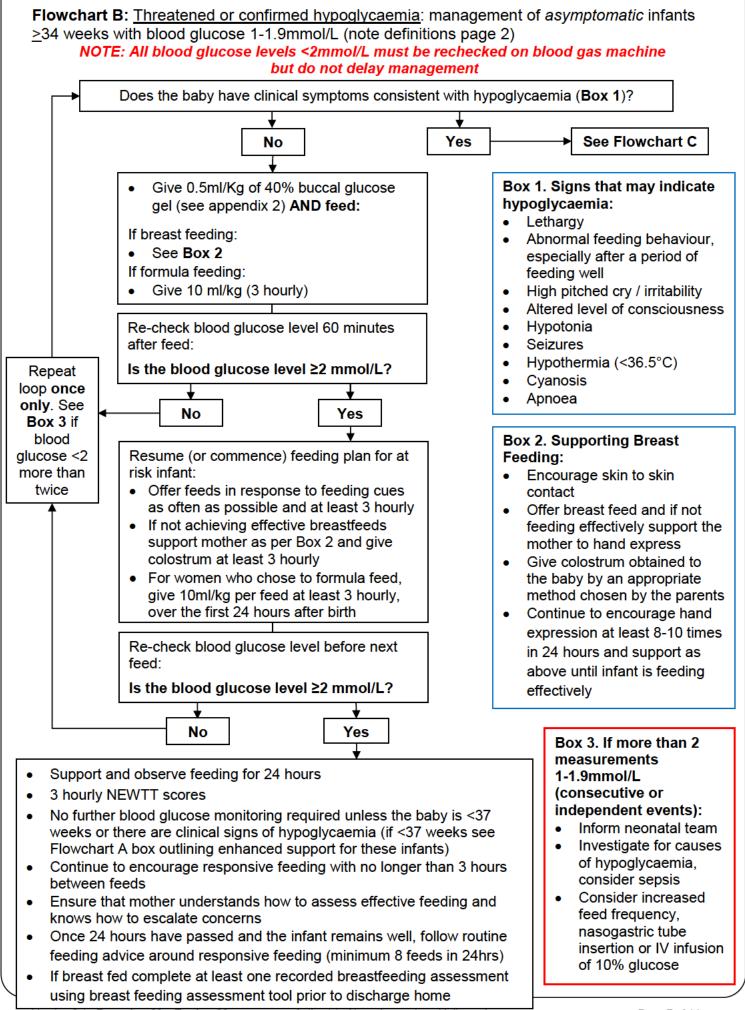
NHS Improvement (2017) Reducing harm leading to avoidable admission of full-term babies into neonatal units. Findings and resources for improvement. London: NHS Improvement.

Royal United Hospitals Bath NHS Foundation Trust (2017) Neonatal Clinical Guideline Hypoglycaemia in the Newborn \geq 34+0 weeks. Bath: Royal United Hospitals Bath NHS Foundation Trust.

UNICEF UK Baby Friendly Initiative (2013) Guidance on the development of policies and guidelines for the prevention and management of hypoglycaemia in the newborn. London: UNICEF UK Baby Friendly Initiative.

Flowchart A: <u>Risk of hypoglycaemia</u>: management of *asymptomatic* infants <u>></u>34 weeks as per criteria on page 2





Flowchart C: <u>Confirmed significant hypoglycaemia</u>: management of infants who are *symptomatic* and/or with blood glucose <1mmol/L

NOTE: All blood glucose levels <2mmol/L must be rechecked on blood gas machine but do not delay management

Immediate management: for midwives / nursing staff:

- Call neonatal team immediately and request urgent review using SBAR
- Give 0.5ml/Kg of 40% buccal glucose gel

Neonatal Medical team Management:

- Obtain urgent IV access
- If unable to get immediate iv access consider
 - intramuscular glucagon, kept in fridge (200 micrograms/kg, maximum dose 1mg)
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 - or 0.5ml/Kg of 40% buccal glucose gel
- Collect blood sample for laboratory confirmation of blood glucose, hypoglycaemia screening tests and site a urine bag
- Consider screening and treatment for sepsis
- Admit to neonatal unit
 - Give IV 10% glucose bolus 2.5 ml/kg
 - Start IV infusion of 10% glucose at
 - 60ml/kg/day (=4.2 mg/kg/min)
 - Do not stop the establishment of breast feeding unless the baby is too sick to feed or there is a clinical contraindication to enteral feeding. Support expression of breast milk.
 - In formula fed infants, continue feeds if no contraindication to enteral feeding.
 - Recheck blood glucose after 30 minutes

Blood glucose < 1mmol/L or abnormal clinical signs.

- Give IV 10% glucose bolus 2.5ml/kg
- Increase glucose delivery rate by 2mg/kg/minute by increasing volume and/or concentration of glucose infusion*
- Recheck BG after 30
 minutes
- Repeat cycle if BG < 1 mmol/L or there are abnormal clinical signs
- Consider central IV access if requiring >12.5% glucose

Blood glucose 1-2.5mmol/L and no abnormal clinical signs

- Increase glucose delivery rate by 2mg/kg/minute but increasing the volume and/or concentration of glucose infusion*.
- Continue to feed if no contraindication.
- Recheck blood glucose after 30 minutes.

Blood glucose > 2.5 mmol/L

- Continue enteral feeds
- Slow wean off IV infusion
- Continue to monitor blood glucose until infant is on full enteral feeds and blood glucose values are
 >2.5mmol.L or 3 mmol/L in cases of hyperinsulinism, over several fast-feed cycles, for at least 24 hours

*If glucose infusion rate >8mg/kg/min, test for hyperinsulinism

Appendix 1: Identification of infants at risk of hypoglycaemia

For display in clinical areas

Please ensure you refer to full guideline <u>'Identification and Management of Neonatal</u> <u>Hypoglycaemia'</u> available via the Trust DMS.

Infants at risk of hypoglycaemia:

- Preterm infants born <u>></u>34 36+6 weeks gestation
- ➤ Term infants with intrauterine growth restriction (birthweight ≤ 2nd centile- see appendix 1) or clinically wasted*
- Infants of diabetic mothers
- Infants of mothers taking beta blockers in the third trimester and / or at the time of delivery
- Cord pH < 7.1 and/or base deficit ≥ -12mmol</p>

If these infants are well, manage according to flowchart A

These infants should have postnatal care on transitional care.

Centile chart to define IUGR for infants born at term:

Infants born <u>at or below these weights</u>, corresponding to their relevant gestational age in completed weeks, are at risk of hypoglycaemia.

Birth weight on 2nd centile (kg)

Gestational age (completed weeks)	Boys	Girls
37	2.1	2
38	2.3	2.2
39	2.5	2.45
40	2.65	2.6
41	2.8	2.75
42	2.9	2.85

Term infants born <2nd centile for gestational age are at risk of hypoglycaemia

Clinical signs of wasting in a newborn infant:

Wasting of the soft tissues, such as muscle and subcutaneous fat, which may be recognised in the infant at birth by the presence of <u>dry</u>, <u>peeling skin</u>, <u>or loose</u>, <u>wrinkled skin and little muscle</u>, <u>especially in the upper legs</u>, <u>giving the appearance that the infant has recently lost weight</u>. These clinical signs suggest that the fetus has been undernourished during the last weeks of pregnancy and, as a result, has very few energy stores at birth (i.e. little glycogen, fat and muscle).

Appendix 2: Identification of hypoglycaemic infants

For display in clinical areas

Please ensure you refer to full guideline <u>'Identification and Management of Neonatal</u> <u>Hypoglycaemia</u>' available via the Trust DMS.

Symptoms of hypoglycaemia in newborn infants:

- Lethargy
- Abnormal feeding behaviour, especially after a period of feeding well
- High pitched cry / irritability
- Altered level of consciousness
- Hypotonia
- Seizures
- Hypothermia (<36.5°C) not attributed to environmental factors
- Cyanosis
- Apnoea

Infants who appear clinically unwell should have an immediate blood sugar and set of NEWTT observations taken, and be reviewed urgently by a member of the neonatal team. (Neonatal tier 1 bleep: 2934, Neonatal tier 2 bleep: 2935)

Confirmed hypoglycaemia is defined as:

1. A value < 1mmol/L at any time	▷ refer to <u>flowchart C</u>
2. Baby with abnormal clinical signs a single value of < 2.5mmol/L	▹ refer to <u>flowchart C</u>
3. Baby at risk but well, with 2 consecutive measurements 1-1.9mmol/L	 refer to <u>flowchart B</u> (after one measurement)

(Thresholds for intervention as defined by BAPM 2017)

Appendix 3: Use of buccal glucose gel: according to flowcharts B or C

Indications

- Blood glucose 1-1.9mmol/l in infant with no abnormal clinical signs
- Confirmed hypoglycaemia without intravenous access
- Infants \geq 34 weeks gestational age and younger than 48 hours after birth

Notes

- Must be used in conjunction with a feeding plan
- For babies with severe hypoglycaemia (BG <1mmol/I) use buccal glucose gel only as an interim measure while arranging for urgent medical review and treatment with IV glucose

Dose

• Use 40% glucose gel 0.5ml/kg, up to two doses given 30 minutes apart per episode of hypoglycaemia, and a maximum of six doses of buccal glucose gel in 48 hours.

Method of administration

- Draw up correct volume of 40% glucose gel using an appropriately sized oral syringe (purple)
- Dry oral mucosa with gauze, gently squirt gel with syringe (no needle) onto the inner cheek and massage gel into the mucosa using latex-free gloves
- Offer a feed, preferably breast milk, immediately after administering glucose gel
- Repeat blood sugar measurement as requested
- Repeat oral glucose gel if baby remains hypoglycaemic according to flow chart

On-going care

• Up to 6 doses can be given over a 48-hour period but any more than two doses should be discussed with the neonatal team, and it is advisable for the baby to be examined before the 3rd dose is administered.

Appendix 4: Parent Information Leaflet content

(See also published leaflet available via DMS)

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 (2-4 hours after birth), 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.

Keep your baby close.

Skin to skin remains beneficial for you and your baby. Still keep your baby near you when not skin to skin so that you can recognise early feeding cues and respond to your baby readily.

Feed for as long, or as much, as your baby wants.

To ensure your baby gets as much milk as possible. Access support with feeding to make sure your baby is feeding effectively.

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

(Appendix 4 continued)

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 Central Delivery Suite on 0117 3425213 or 0117 3425214. 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.

The team may prescribe a dose of glucose (sugar) gel as part of the feeding plan because this can be an effective way to bring your baby's glucose level up quickly.

(Appendix 4 continued)

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 your 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.