Neonatal Enteral Nutrition Guideline

University Hospitals of Leicester NHS Trust

Trust ref: C105/2005

Contents

1. Introduction and Who Guideline applies to

Early optimal nutrition improves neurodevelopmental outcomes in preterm infants. However, preterm infants are 6-8 weeks behind in their nutritional achievements prior to discharge from the neonatal intensive care. Preterm infants will rapidly deplete their limited nutrient reserves; therefore, it is important to implement nutritional rehabilitation at the earliest opportunity. This is achieved by weekly review of nutritional intake to achieve and maintain expected growth.[1-6]

The goals of nutritional support in preterm infants are to:

- **Meet the recognised nutritional requirements (Table 1 in Appendix 1)**
- **Achieve a postnatal growth rate that approximates intra-uterine growth of a normal foetus at the same gestational age (Table 2 in Appendix 1)**

This guideline aims to inform nutritional management of:

1. Preterm babies (<32 weeks gestation)
2. Preterm small for gestational age babies (< 1.5 kg)

Related documents:

Parenteral Nutrition UHL Neonatal Guideline Trust ref: C28/2018
Nutrient Enriched Preterm Formula UHL Neonatal Guideline Trust ref:C8/2010
Probiotics Administration in Preterm Infants UHL Neonatal Guideline Trust ref: C47/2018
Feeding Babies of Less than 30 Weeks Gestation UHL Neonatal Guideline Trust ref: C105/2005
Surgical Handbook UHL Neonatal Guideline Trust ref: C18/2021
Breast Feeding Support UHL Obstetric Guideline Trust ref: C120/2008

Key Points

1. **Actively support breast feeding friendly measures to enable breast milk as the feed of choice**
2. **Buccal Colostrum used as an oral immunotherapy along side normal nasogastric feeds.**
3. **0.2 ml buccal colostrum is recommended for 5 days after birth, alongside any other nasogastric tube feed as considered appropriate, and even in babies who are nil by mouth (confirm with consultant on a case-by-case basis)**
4. **Routine check of gastric residual volume is not required**
5. **Minimal enteral feed is recommended within 24 hours of birth in a stable baby**
6. **Aim to initiate feed as per flow chart**
7. **Aim to achieve a weight gain of 18g/kg/day in babies less than 30 weeks and 15g/kg/day in babies 30-36 weeks post conceptual age respectively**
8. **Starting weaning parenteral nutrition when total fluids (enteral + TPN) reach 150 ml/kg/day**
9. **Weekly review of growth chart and nutritional intake to achieve and maintain expected growth (Table 1) (Table 2)**
10. **Dietician referral is recommended for babies with complex nutritional needs**

2. Guideline Standards and Procedures

2.1 Nutritional requirement [7-10]

Infant's nutritional intake should be reviewed daily and adjusted to meet nutritional requirements. We acknowledge there may be deficit in protein and micronutrient intake. This will be reviewed on a regular basis by the clinical team using growth parameters.

Table 1 displays the enteral nutritional requirements to achieve expected growth as per Table 2.

Higher calorie intakes may be needed for infants with increased energy requirements e.g. infants with severe chronic lung disease or those with increased losses via intestinal stoma.
See Appendix 1 for table of nutritional requirements and anthropometric monitoring

2.2 Weight Monitoring [11-12]

Most early preterm infants lose up to 15% or 1 centile of birth weight due to loss of extracellular fluid. They tend to regain their birth weight by 14-21 days of life.

Extreme preterm babies on TPN from birth will show less weight loss than babies transitioning from IV fluids to milk. This is due to maintaining protein intake form birth and is further supported by early introduction of breast milk fortifier,

- Measure and document weight and OFC as a minimum weekly in BadgerNet as per Table 2 below. Most babies should be weighed at least twice a week.
- Review BadgerNet growth chart on a weekly basis
- For infants who are fluid overloaded, working weight should be their highest dry weight.

Use BadgerNet to review and document weight and OFC as per Table 2 in Appendix 1

2.3 Actively support Breast feeding friendly measures [13]

Human breast milk is considered the optimal feed for the preterm baby. Make every effort to use mother's fresh expressed colostrum and breast milk.

Healthcare professionals, particularly midwives and NNU staff, have a key role in supporting mothers to establish and improve their breastmilk supply. For further support please contact named NNU Infant Feeding Advisor.

Mothers should be advised and supported to express breast milk within 1 hour after birth and to continue at regular intervals, aiming for 8 -10 x day, with at least one expression overnight.

If breast milk is not available by 48 hours after birth or if EBM is insufficient to meet the infants' ongoing fluid demands, supplement with formula as per Nutrient Enriched Preterm Formula Guideline.

2.4 Breast milk Fortification [14-16]

Breast milk fortifiers (BMF) have been developed to provide additional protein, calcium, and phosphate as well as vitamins and trace minerals. BMF is associated with short term increase in weight gain, and in linear and head growth[5].

Start BMF once feeds reach 120 mls/kg/day and continue to increase feeds up to 165 mls/kg/day as per rate increase guidance below. Maintain baby on 165mls/kg/day of fortified

EBM for 1 week and monitor growth. Increase further to 180 mls/kg/day if subsequent growth suboptimal. Ensure dietetic involvement if not achieving adequate weight gain on 180mls/kg/day before increasing feeds further.[38]

For babies between 32 and 34 weeks gestation who may require BMF – refer to the Guideline for Breast Milk fortifier.

Add BMF once the neonate has reached 120 ml/kg/day of human milk.
BMF should not be added to formula
Stop BMF if milk feeds are being mixed with formula during change over

2.5 Buccal Colostrum [17-23]

Emerging evidence has demonstrated the potential benefits of administering colostrum via the buccal mucosa on health outcomes in preterm infants. Buccal colostrum can be used even in the critically-ill, ventilated, fragile infants.

Colostrum, given by buccal route is used as early as possible, in anticipation of more mother's breast milk to feed her baby. This is considered as Oral Immune Therapy (OIT).

The intended benefits of supporting early buccal colostrum (OIT) use on the neonatal unit at UHL are to promote and support:

- early maternal milk expression
- breast feeding for all babies on the NNU
- bonding between mother, family and baby,
- a longer duration of breast feeding for the preterm baby, after discharge from the neonatal unit

In addition to the overall benefits of breast milk and early feeding, there is some limited evidence to support that buccal colostrum may contribute to

- promoting a more physiological microbiome of the gastrointestinal and respiratory tract, and
- stimulating the oropharyngeal-associated lymphoid tissue system.

- Refer to Buccal Colostrum (OIT) advice guide (Appendix 3)

• Give 0.2 ml buccal colostrum 2 hourly (use alternate cheeks for alternate 2 hours) for the first five days of life in all babies who are on the unit and are not breast fed. This can be done in parallel to enteral feeds as considered appropriate by the team

• Advise and encourage mother, father or appropriate support individual for mother, to give buccal colostrum by providing information leaflet and video resource

2.6 Minimal enteral nutrition (MEN) and advancement [24-26]

MEN is defined as the practice of providing small amounts of preferably breast milk to prevent gastrointestinal atrophy and facilitate gastrointestinal mucosal maturation and enzymatic activity. MEN should be commenced as soon as the infant is deemed clinically stable.

Start MEN at 15mls/kg/day divided into 2 hourly feeds as soon as available. Wait up to 24 hours if DEBM or preterm formula needs to be used.

Clinically stable is defined as:

- Clinical examination within normal limits
- Cardiovascular parameters stable for at least 6 hours
- Minimal GR that is not dark green

Refer to Flowchart 1 below for feed initiation and advancement guidance.

Contraindications to feed:

- Suspected/ Confirmed NEC or ileus
- Clinical signs suggestive of Intestinal obstruction or perforation
- Babies awaiting definitive bowel surgery

Rates of Feed Increase

Babies who show good feed tolerance and who are not growth restricted should ideally be fed at the higher rate. Smaller babies or those not tolerating milk well may benefit from the slower rate of increase.
It would be recommended for babies to be held by parents during feeding when possible when they are stable. There is evidence to suggest improved feed tolerance when babies are fed whilst having kangaroo care.

Flow Chart 1 - Guidance on feed initiation, MEN and advancement [27-30]

Gestation <32 weeks and < 1.5kg

Step 1 First 24 hours - start PN, buccal colostrum, MEN

Start parenteral nutrition (PN) as per Neonatal PN guidelines

ALL infants should receive their mother's colostrum BUCCALLY for a minimum of 5 days after birth. Aim for 0.2ml 2 hourly

- If <0.2ml of colostrum is expressed give the volume you have available
- If baby can commence feeding and >0.2ml colostrum/breastmilk expressed, give 0.2ml buccally and the extra as MEN (see below).

If breast milk is not available by 24 hours, refer to Nutrient Enriched Preterm Formula UHL Neonatal Guideline

Step 2a 24-48 hours- continue MEN, commence Probiotics

Start MEN at 15 mls/kg/day as 2 hourly feeds as soon as breast milk is available. Wait up to 24 hours if DEBM or preterm formula needs to be used.
Give MEN for **24** hours but can be up to 48 hours if concerns

Probiotics should be started in the first 24 hours (Refer to Probiotics Administration in Preterm Infants UHL Neonatal Guideline).

Step 2b After 48 hours- commence feeds

To increase feeds by 30ml/kg every 24 hours until full feeds reached (Appendix 4a). If feeds are persistently not tolerated at 30ml/kg advances, consider reducing the volume of increase to 20 ml/kg every 24 hours. (Appendix 4b).
High risk babies may need this slower rate initially until early feeds are established

Step 3 Advance feeds as tolerated

Continue increasing until **maximum** enteral volume achieved
Add BMF once baby is on 120 mls/kg/day

Expressed breast milk up to 165 ml/kg/day (increased to 180mls/kg/day if growth poor)

Preterm formula 150 ml/kg/day for Infants

Mixed feeding with ≤50% formula, 165 ml/kg/day

2.7 Titration of Enteral and Parenteral Nutrition [7]

Rapid reduction in parenteral nutrition (PN) during feed advancement can result in a nutritional deficit.

Feeds to be included in calculation of total daily fluid once 15ml/kg/day enteral nutrition (EN) is achieved.

When to start PN weaning: Start weaning once combined total fluids of PN and enteral feeds reach 150mls/kg/day - wean according to rate of increase of EN
When to stop PN: Stop PN once 150ml/kg/day EN achieved unless there are concerns of nutritional depletion or suboptimal growth

Feed intolerance and management of gastric residual volumes [31-35]

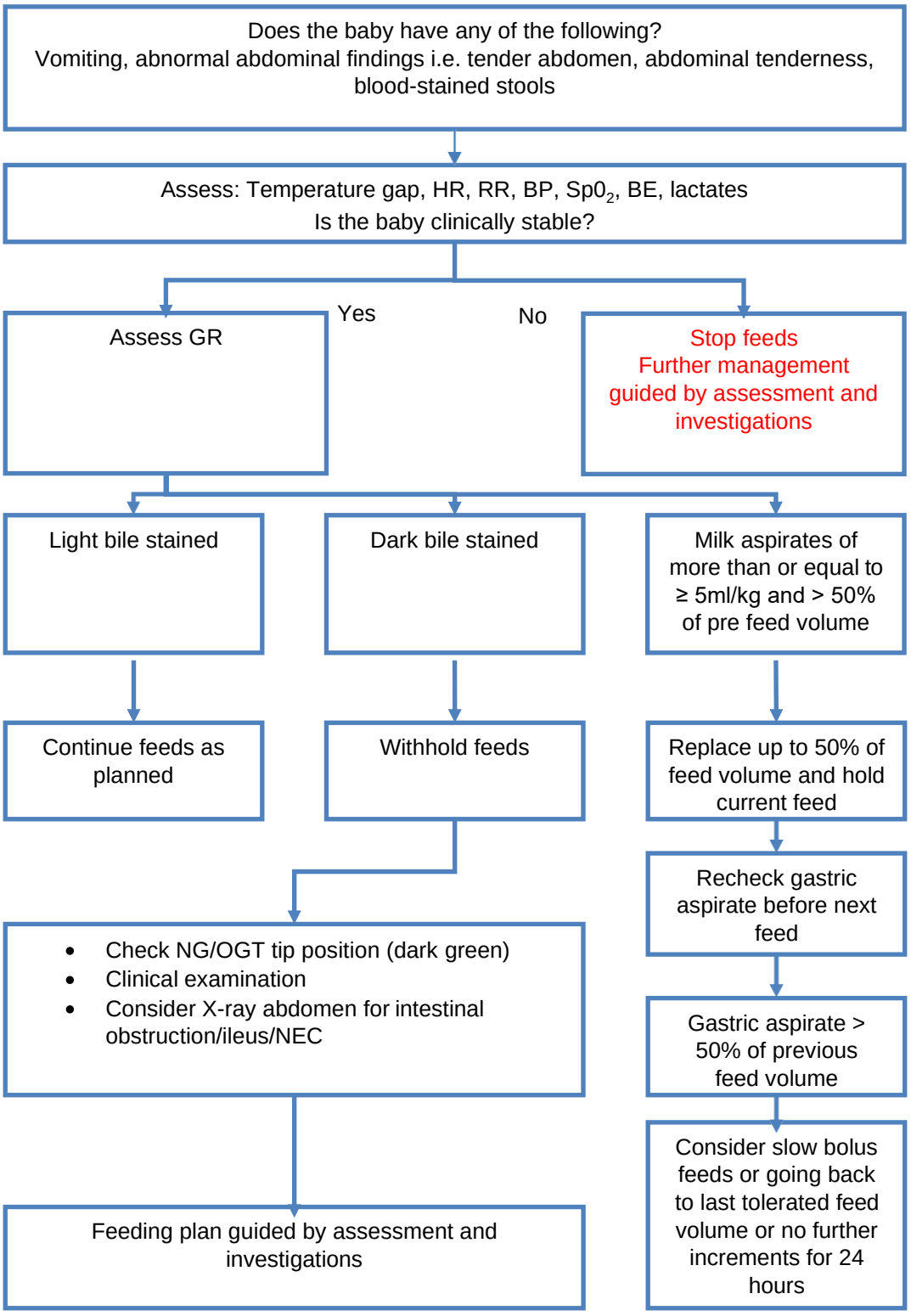
There is no evidence that the measuring of gastric residual volume (GRV) is a useful guide for advancing feeds or helps to detect the onset of necrotising enterocolitis.
A randomized trial in 143 infants <1250 g birth weight who were fed human milk, omission of GRV measurements increased delivery of enteral nutrition, improved weight gain, and led to earlier hospital discharge, without significant effects on risk for NEC or other complications.
Measuring GRV may still be useful as part of an assessment of individual babies with symptoms of feed intolerance, especially abdominal distension or vomiting.

- **Vomiting bile**: May indicate an intestinal obstruction or ileus. Feeds will need to be withheld in these cases and surgical opinion sought.

- **Blood aspirates:** May indicate an inflammatory process. Examine the baby. If the baby is well, continue feeds.

- **Dark green aspirates:** generally accepted as abnormal when the feeding tube is believed to be correctly positioned in the stomach. Please refer to the UHL policy for NG position checking

Flow Chart 2 - Indications for assessing gastric residual volumes and management.



2.8 Referral criteria to nutrition specialists

Dietitian
Referral request for a dietitian review outside of the weekly nutrition reviews.

Nutrition Round
Nutrition reviews conducted weekly involve discussions of each baby's current growth and nutritional status. It is also an opportunity to identify babies who may need discussion with the gastroenterology team. Recommendations for managing feeds will be made by the dietician, to be reviewed by the service consultant.

Gastro Round
Gastro round is conducted on an adhoc basis at LRI NNU depending on cases needing this input. The team includes a paediatric gastroenterologist, paediatric gastroenterology nurse, neonatal dietitian and neonatal pharmacist.

Gastro rounds are to discuss the following cases:

- Complex gastroenterology cases and/or babies who are struggling to progress with enteral feeds.
- Babies likely to be transferred to the Children's Hospital for medium-term or long-term parenteral nutrition.
- Babies who are persistently struggling to gain weight adequately, despite dietetic involvement.

3. Education and Training

None

4. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
All eligible babies (i.e preterm, sick term) who cannot be put to the breast, but are able to receive orogastric feeds, should for the first 5 days of life, receive 0.2 ml buccal colostrum. This should ideally be given within 6 hours of birth.	Audit			Departmental audit group
Stable preterm infants < 1000gm should start MEN within 24 to 48 hours of birth	Audit			Departmental audit group
Weekly review of growth chart and nutritional intake	Audit			Departmental audit group

5. Supporting References

1. Stephens, B.E., Walden, R.V., Gargus, R.A., Tucker, R., McKinley, L., Mance, M., Nye, J. and Vohr, B.R. (2009) *First-Week Protein and Energy Intakes Are Associated With 18-Month Developmental Outcomes in Extremely Low Birth Weight Infants*, 123 edn., : Paediatrics

2. Yang, J., Chang, S. S. and Poon, W. B. (2016) 'Relationship Between Amino Acid and Energy Intake and Long-Term Growth and Neurodevelopmental Outcomes in Very Low Birth Weight Infants', *JPEN J Parenter Enteral Nutr,* 40(6), pp. 820-6.

3. Balakrishnan, M., Jennings, A., Przystac, L., Phornphutkul, C., Tucker, R., Vohr, B., Stephens, B. E. and Bliss, J. M. (2017) 'Growth and Neurodevelopmental Outcomes of Early, High-Dose Parenteral Amino Acid Intake in Very Low Birth Weight Infants: A Randomized Controlled Trial', *JPEN J Parenter Enteral Nutr*, pp. 148607117696330.

4. Grover A, Khashu M, Mukherjee A, Kairamkonda V. Iatrogenic malnutrition in neonatal intensive care units: urgent need to modify practice. JPEN J Parenter Enteral Nutr. 2008 Mar-Apr;32(2):140-4.

5. Ng, D. V., Brennan-Donnan, J., Unger, S., Bando, N., Gibbins, S., Nash, A., Kiss, A. and O'Connor, D. L. (2017) 'How Close Are We to Achieving Energy and Nutrient Goals for Very Low Birth Weight Infants in the First Week?', *JPEN J Parenter Enteral Nutr,* 41(3), pp. 500-506.

6. Belfort, M. B. and Ehrenkranz, R. A. (2017) 'Neurodevelopmental outcomes and nutritional strategies in very low birth weight infants', *Semin Fetal Neonatal Med,* 22(1), pp. 42-48.

7. Agostini G et al. (2010) Enteral Nutrient Supply for Preterm Infants: Commentary from the European Society for Paediatric Gastroenterology, Hepatology and Nutrition Committee on Nutrition. Jounal of Pediatric Gastroenterology and and Nutrition 50 (1): 85-91.

8. Koletzko B et al. Nutritional Care of Preterm Infants. Scientific Basis and Practical Guidelines, World Review of Nutrition and Dietetics, Karger 2014 vol 110: 304-305

9. Justyna, C-K (2020) *Mineral and nutritional requirements of preterm infant*, : Seminars in Fetal and Neonatal Medicine.

10. Kumar, R. K., Singhal, A., Vaidya, U., Banerjee, S., Anwar, F. and Rao, S. (2017) 'Optimizing Nutrition in Preterm Low Birth Weight Infants-Consensus Summary', *Front Nutr,* 4, pp. 20.

11. Cloherty, J.P., Eichenwald, E.C., Hansen, A.R., Stark, A.R. (2012) *Manual of Neonatal Care* , 7th edn., Lippincott Williams and Wilkins: Philadelphia.

12. Riskin, A. (2017) 'Meeting the nutritional needs of premature babies: their future is in our hands', *Br J Hosp Med (Lond),* 78(12), pp. 690-694.

13. Isaacs, E. B., Fischl, B. R., Quinn, B. T., Chong, W. K., Gadian, D. G. and Lucas, A. (2010) 'Impact of breast milk on intelligence quotient, brain size, and white matter development', *Pediatr Res,* 67(4), pp. 357-62.

14. Brown JV, Lin L, Embleton ND, Harding JE, McGuire W. Multi-nutrient fortification of human milk for preterm infants. Cochrane Database of Systematic Reviews 2020, Issue 6. Art. No.: CD000343. DOI: 10.1002/14651858.CD000343.pub4.

15. Alyahya W, Simpson J, Garcia A, L, Mactier H, Edwards C, A: Early versus Delayed Fortification of Human Milk in Preterm Infants: A Systematic Review. Neonatology 2020;117:24-32. doi: 10.1159/000501279

16. Biasini, A., Neri, C., China, M. C., Monti, F., Di Nicola, P. and Bertino, E. (2012) 'Higher protein intake strategies in human milk fortification for preterm infants feeding. Auxological and neurodevelopmentaloutcome', *J Biol Regul Homeost Agents,* 26(3 Suppl), pp. 43-7.

17. Maffei, D., Brewer, M., Codipilly, C. *et al.* Early oral colostrum administration in preterm infants. *J Perinatol* **40,** 284–287 (2020). https://doi.org/10.1038/s41372-019- 0556-x

18. Panchal H, Athalye-Jape G, Patole S. Oropharyngeal Colostrum for Preterm Infants: A Systematic Review and Meta-Analysis. Adv Nutr. 2019 Nov 1;10(6):1152-1162. doi: 10.1093/advances/nmz033. PMID: 31147686; PMCID: PMC6855966.

19. Nasuf AWA, Ojha S, Dorling J. Oropharyngeal colostrum in preventing mortality and morbidity in preterm infants. Cochrane Database Syst Rev. 2018;9:CD011921

20. Ma A et al. Oropharangeal colostrum therapy reduces the incidence of ventilator-associated pneumonia in very low birth weight infants: a systematic review and meta-analysis. Pediatric Research 2020 (online publication) https://doi.org/10.1038/s41390-020-0854-1

21. Lee et al. 2015. Oropharangeal colostrum administration in extremely preterm infants: an RCT. Paediatrics, vol 135, no 2, p. e 357., 1098-4275

22. Rodriguez NA. Caplan MS. 2015. Oropharayngeal administration of Mother's milk to prevent NEC in ELBW infants. The journal of perinatal and neonatal nursing 81-90.

23. Snyder R, et al., (2017), Early provision of oropharyngeal colostrum leads to sustained breast milk feedings in preterm infants, Pediatrics and Neonatology

24. Lenhartova, N., Matasova, K., Lasabova, Z., Javorka, K. and Calkovska, A. (2017) 'Impact of early aggressive nutrition on retinal development in premature infants', *Physiol Res,* 66(Supplementum 2), pp. S215-S226.

25. Morgan J, Bombell S, McGuire W. Early trophic feeding versus enteral fasting for very preterm or very low birth weight infants. Cochrane Database of Systematic Reviews 2013, Issue 3. Art. No.: CD000504

26. Vlaardingerbroek, H., van Goudoever, J. B. and van den Akker, C. H. (2009) 'Initial nutritional management of the preterm infant', *Early Hum Dev,* 85(11), pp. 691-5.

27. Abbott, J., Berrington, J., Bowler, U., Boyle, E., Dorling, J., Embleton, N., Juszczak, E., Leaf, A., Linsell, L., Johnson, S., McCormick, K., McGuire, W., Roberts, T., Stenson, B. and Group, S. I. (2017) 'The Speed of Increasing milk Feeds: a randomised controlled trial', *BMC Pediatr,* 17(1), pp. 39.

28. Dorling J et al. Incremental milk-feeding rates in preterm infants. N Engl J Med 381;15:1434-1443

29. Dorling J et al. Two Speeds of increasing milk feeds for very preterm or very low-birthweight infants: the SIFT RCT. NIHR Health Technology Assessment April 2020:24(18)

30. Leaf A et al. ADEPT- Abnormal Doppler Enteral Prescription Trial. BMC Pediatr 2009 Oct 2; 9:63.

31. Parker L et al. Aspiration and Evaluation of Gastric Residuals in the NICU: State of the Science. J Perinat Neonatal Nurs. 2015 Jan-Mar; 29(1): 51–59.

32. Mihatsch WA et al. The significance of gastric residuals in the early enteral feeding advancement of extremely low birth weight infants. Pediatrics. 2002;109(3):457

33. Jadcherla SR, Kliegman RM. Studies of feeding intolerance in very low birth weight infants: definition and significance. Pediatrics 2002; 109:516.

34. Parker et al. Effect of Gastric Residual Evaluation on Enteral Intake in Extremely Preterm Infants. A randomised clinical trial. JAMA Pediatrics. 173:6:

35. ParkerLA, Weaver M, Murgas Torrazza RJ, et al. Effects of Aspiration and Evaluation of Gastric Residuals on Intestinal Inflammation, Bleeding and Gastrointestinal Peptide Level. J Pediatr 2019 Nov 19

36. Ojha S, Dorling J et al. Optimising nutrition during therapeutic hypothermia. Arch Dis Child Fetal Neonatal Ed. 2019 May; 104(3): F230–F231

37. Gandecha H, Kaur A, Sanghera R, Preece J, Pillay T. Nutrition and Immunity in Perinatal Hypoxic-Ischemic Injury. Nutrients. 2022 Jul 1;14(13):2747. doi: 10.3390/nu14132747. PMID: 35807927; PMCID: PMC9269416.

38. Embleton, Nicholas David; Moltu, Sissel Jennifer; Lapillonne, Alexandre; van den Akker, Chris H.P.; Carnielli, Virgilio; Fusch, Christoph; Gerasimidis, Konstantinos; van Goudoever, Johannes B.; Haiden, Nadja; Iacobelli, Silvia; Johnson, Mark J.; Meyer, Sascha; Mihatsch, Walter; de Pipaon, Miguel Saenz; Rigo, Jacques; Zachariassen, Gitte; Bronsky, Jiri; Indrio, Flavia; Köglmeier, Jutta; de Koning, Barbara; Norsa, Lorenzo; Verduci, Elvira; Domellöf, Magnus. Enteral Nutrition in Preterm Infants (2022): A Position Paper from the ESPGHAN Committee on Nutrition and invited experts. Journal of Pediatric Gastroenterology and Nutrition ():10.1097/MPG.0000000000003642, October 21, 2022. | DOI: 10.1097/MPG.0000000000003642

6. Key Words

Breast feeding, Buccal Colostrum, Minimal Enteral Nutrition (MEN)

The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.
As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Original authors: **Panjwani D, Giga S, Wright L, Kairamkonda V** D Panjwani – Consultant J Preece – Consultant R Fox - Dietitian	**Executive Lead** Chief Nurse

Details of Changes made during review:			
Date	**Issue Number**	**Reviewed By**	**Description Of Changes (If Any)**
2005	**1**	Guideline Meeting Neonatal Governance Meeting	**Ratified**
August 2008	2	Guideline Meeting Neonatal Governance Meeting	Approved
February 2021	3	Guideline Meeting Neonatal Governance Meeting	Ratified
May 2023	4	Guideline Meeting Neonatal Governance Meeting Women's Quality & Safety Board May 2023	Buccal colostrum to be used alongside NG feeds and recommended for 5 days (previously 48 hours) after birth even if baby NBM. Buccal colostrum to be considered as oral immune therapy. Use alternate cheeks for alternate 2 hours. Buccal colostrum should be given as soon as colostrum is available ***and ideally within 6 hours of birth(previously stated 2 hours)*** **Start weaning parenteral nutrition when total fluids (enteral + TPN) reach 150 ml/kg/day** . Amended - If breast milk is not available by 24 hours, now increased to 48 hours after birth or if EBM is insufficient to meet the infants' ongoing fluid demands, supplement with formula as per guideline and volumes amended. Start MEN at 15mls/kg/day divided into 2 hourly feeds as soon as available. Wait up to 24 hours if DEBM or preterm formula needs to be used & rates of feed increase section added. Titration and weaning volumes updated. Added **- Enteral nutritional requirements for preterm infants and term infants table**

Appendix 1 – Nutritional requirements and anthropometric monitoring

Table 1 - Enteral nutritional requirements for preterm infants and term infants

Nutrient	Term infant (SACN, 2010), (SACN, 2016)		Preterm infant 1000 g – 1800g (ESPHGAN, 2010) (Koletzko, 2014)
Energy (Kcal/kg/day)	Breast fed 96	Formula/ combination 120	115-140
Protein (g/kg/day)	2.1 - 2.6		3.5 – 4.5
Sodium (mmol/kg/day)	1.5		3-5
Potassium (mmol/kg/day)	3.4		2-3
Calcium (mmol/kg/day)	3.8		3-5
Phosphate (mmol/kg/day)	2.1		2.2-3.7
Folic Acid	50ug/day		23-100µg/kg/day
Vitamin D (iu/kg/day)	8.5 -10		400-700
Vitamin A	350ug RE/day		1333-3300 IU/Kg/day
Iron	1.7 mg/day		2-3mg/kg/d (from 2 weeks old)

Appendix 2: Table 2 - Guide to anthropometric monitoring and expected growth in preterm and term infants

<table>
<tr><th></th><th colspan="3">Aim</th><th>Indicates</th><th>Frequency</th></tr>
<tr><td rowspan="2">Weight</td><td><30 weeks post conceptual age</td><td>30-36 weeks post conceptual age</td><td>>36weeks post conceptual age</td><td rowspan="2">Fluid balance changes

Changes in adipose tissue and lean body mass.</td><td rowspan="2">On admission and a minimum of 2 times per week</td></tr>
<tr><td>18g/kg/day</td><td>15g/kg/day</td><td>30g/day</td></tr>
<tr><td>Length</td><td colspan="3">Velocity = 1.4cm per week</td><td>Skeletal growth and organ growth</td><td>As required, for babies with weight concerns to optimise nutritional management</td></tr>
<tr><td>Head circumference</td><td colspan="3">Velocity = 0.9cm per week.

(Needs assessment in conjunction with appropriate head scans)</td><td>Brain growth and brain pathology</td><td>On admission and Weekly</td></tr>
</table>

Appendix 3 – Buccal Colostrum Guide

General Guidance

- All mothers anticipating delivery of a preterm infant less than 34 weeks gestation should be informed about buccal colostrum. More mature babies in intensive care will benefit from buccal colostrum and this should be discussed even if the mother is intending eventually to formula feed.[37] (refer to information for parents' section below).
- Mothers should be advised to express as soon as possible after delivery. This information must also be included in antenatal counselling.
- Only the mother's own colostrum should be used.
- Fresh colostrum should be administered. Colostrum stored in the fridge may be used if fresh colostrum is unavailable. Avoid freezing colostrum due to degradation of the bioactive compounds.
- Buccal colostrum should be given as soon as colostrum is available ***and ideally within 6 hours of birth*.**

Administration (Strict Aseptic Non-Touch Technique)

1. Provide mother with labelled sterile 1ml 'colostrum' syringes with caps, for colostrum collection**.
2. Colostrum can be collected in these syringes or a sterile bottle.
3. At the infant's bedside, ensure infant's details match the details on the colostrum container. Perform mouth care as routine.
4. Remove the cap of the syringe and gently insert the tip of the syringe into the infant's mouth along the right side and directed posteriorly towards the oropharynx. Administer a **maximum of 0.2 ml** of colostrum slowly on one side initially then the other side.
5. Repeat the procedure **every 2 hours** until milk supply adequate for more substantial enteral feeding (minimal enteral feed, and thereafter incremental feeds as required).

   NB: At all stages follow ANTT method: i.e use clean gloves for the procedure, and do not touch the syringe/bottle inlet/inside cap.

NB: Avoid oral suction for 30 min. Monitor the vital signs of the infant throughout the procedure. Do not use a swab as this will absorb colostrum leaving little to be absorbed by the infant.

**Ensure the colostrum is appropriately labelled with the baby's identifications

Appendix 4 – How to increase milk feeds

Step 2b on Flowchart 1. There are 2 methods to get to the increments. Both lead to the same volume of increment.

Scenario 1:

800g baby has tolerated trophic feeds at 15ml/kg/day and is due to increase enteral feeds by 30ml/kg/day with the baby on 2 hourly feeds:

Increase in feed size over 24 hours = $\frac{\text{Weight (kg) X increase (mls/kg/day)}}{\text{Number of feeds per day}}$ split into 2 increments

Method 1:

Total increase in feed size in 24 hours is : $\frac{0.8 \text{ X } 30}{12}$ = 2mls divided into two 1ml increments

Method 2:

To increase feeds by 30ml/kg every 24 hours until full feeds reached (Appendix 4a).
(This would equate to 15ml/kg feed increase in 12 hours.)

Worked examples of Milk Feed Increase at 30 ml/kg/day increment on 2 HOURLY feed

To calculate increase in feeds:

For example

800g baby increasing enteral feeds by 30ml/kg/d split into 12 hourly increases (15 ml/kg in 2 different increments)

Currently on 15ml/kg/d = 1ml/2hrly

Increasing by 15ml/kg at 10:00 to 30ml/kg/d enteral feeds =

2ml/2hrly Increasing by 15ml/kg at 22:00 to 45ml/kg/d enteral

feeds = 3ml/2hrly

Scenario 2:

1.4kg baby increasing enteral feeds by 30ml/kg/d split into 12hrly

increases Currently on 60ml/kg/d = 7ml/2hrly

Method 1:

Increase in feed size over 24 hours = $\frac{\text{Weight (kg) X increase (mls/kg/day)}}{\text{Number of feeds per day}}$ split into 2 increments

Increase in feed size over 24 hours = $\frac{1.4 \times 30}{12}$ = 3.5 mls split into 2 increments

Therefore feeds would increase by 1.75 ml 12 hourly
i.e 1st increase to 8.7 ml in the 1st 12
hours 2nd increase to 10.5 ml in the 2nd
12 hours

Method 2:

Increasing by 15ml/kg at 02:00 to 75ml/kg/d enteral feeds = 8.7

ml/2hrly Increasing by 15ml/kg at 14:00 to 90ml/kg/d enteral feeds

= 10.5 ml/2hrly