East of England Neonatal ODN
(Hosted by Cambridge University Hospitals)

East of England Neonatal Network

Enteral Feeding of Preterm Infants on the Neonatal Unit – Executive Summary

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For use in: EoE Neonatal Units
Guidance specific to the care of neonatal patients

Used by: Medical Staff, Neonatal Nurse Practitioners, Dietitians, IFLs

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Approved by:

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Ratified by East of England ODN Board:

Chairman East of England ODN Board	**Date:** **Signed:**

Audit Standards:

- **100% of babies on the neonatal unit have feeds initiated and advanced in line with algorithm 1 and where deviation exists a documented explanation is provided.**
- **100% of babies on the neonatal unit receive feeds in accordance with algorithm 2 and where deviation exists a documented explanation is provided.**
- **100% of babies who meet the criteria for human milk fortification receive fortified milk in accordance with algorithm 2 and where deviation exists a documented explanation is provided.**
- **100% of babies on the neonatal units have their anthropometric parameters measured in line with this guidance and where deviation exists a documented explanation is provided.**

Content:

Equality, Diversity & Inclusivity Statement

This policy document aims to meet the diverse needs of our service, population and workforce, ensuring that none are placed at a disadvantage over others. It takes into account the provisions of the Equality Act 2010 and promotes equal opportunities for all. This document ensures that no one receives less favourable treatment on the protected characteristics of their age, disability, sex, gender reassignment, sexual orientation, marriage and civil partnership, race, religion or belief, pregnancy and maternity. The East of England Neonatal ODN advocates due regard to the various needs of different protected equality groups in our network. The East of England Neonatal ODN acknowledges the additional challenges that gender identity can have, specifically around the perinatal period and in regards to infant feeding. We are aware that there is not yet universal language that addresses all families accessing maternity and neonatal care. We refer to breastfeeding and breastmilk but recognise terms such as chestfeeding, bodyfeeding, nursing, lactation, or providing human milk may be more preferable for and accurate to some of the families we support. We support mothers to express their breastmilk and to breastfeed their babies, but we also understand that not all birthing parents will identify as women or as mothers. We will always use the individual's preferred language, name, pronouns or terminology that they most comfortable with, as we recognise the importance of providing inclusive and respectful perinatal information and support to all pregnant women, pregnant people, mothers, parents and families.

Section 1: Introduction

As survival rates for preterm infants improve more emphasis is being put on improving the quality of outcome by giving more focus to optimising nutritional management. Suboptimal nutrient provision commencing in the early neonatal period contributes to postnatal malnutrition and accumulation of growth deficits, especially in the smallest most immature infants. Delaying the introduction of adequate and appropriate enteral luminal nutrition exacerbates nutritional deficits and reduces resistance to infection. Conversely, over nutrition and excessive growth acceleration may lead to adverse health issues such as diabetes, obesity and cardiovascular disease in later life.

The goals of nutritional support in the preterm infant include:

- Achieving an acceptable standard of short term growth.
- Meeting the recognised nutritional requirements of the preterm infant.
- Preventing feeding-related morbidities, especially the prevention of Necrotising Enterocolitis (NEC).
- Optimising longterm outcomes.

The East of England ODN has had standardised guidance in place for parenteral nutrition since 2013 EOE ODN PN guidelines and enteral feeding since 2011. This executive summary, alongside the fully evidenced guideline and accompanying Nutrition Care Pathway represent the fourth update of the network wide enteral feeding guidance. Together they meet the 2022 recommendation from the European Society of Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) that states that all neonatal units establish a standardised feeding protocol that defines the:

- duration of Minimal Enteral Feeds (MEF)
- daily advancement of milk feeds
- definition and management of Gastric Residuals
- definition, and approach to feeding intolerance
- breast milk fortification strategy
- nutritional definition of full enteral feedings

This guideline aims to use available evidence alongside national best practice to provide, within a practical reproducible framework, both optimal nutritional care and the individual nutritional needs of infants born prematurely in the East of England.

It is designed to be used in conjunction with:

- **Individual clinical assessment processes where decisions are made regarding the initiation and advancement of feeds.**
- **Families and parents, who should be involved in decisions relating to nutritional care**
- **Existing network guidelines and policies that support the establishment of oral feeding of preterm infants and the implementation of the WHO Baby Friendly Initiative Standards and Code of Practice.**
- EOE Oral Feeding Guideline

- EOE Neonatal Feeding Guideline

Section 2.0: Summary of Recommendations

2.1 Nutritional requirements of the preterm infant

- The recommended energy intake for most healthy, growing preterm infants is 115-140Kcal/Kg/day.
- Energy intakes of 140 – 160Kcal/Kg/day (alongside appropriate and adequate protein provision) may be needed for infants where growth is suboptimal.
- A protein to energy ratio of 2.8-3.6g/100kcal is recommended when intakes of both are within the recommended ranges.
- The recommended protein intake for preterm infants is at least 3.5 to 4.0 g protein/kg/d (alongside adequate and appropriate energy provision)
- Protein intake may be increased to 4.5 g/kg/d where growth is slow, provided there are no other causes for suboptimal growth.
- Plasma urea should be monitored at regular intervals (ideally 2x week)
    - Urea concentrations (after the first couple of weeks of life) that are lower than local laboratory references ranges (generally 3.5-5.7mmol/L), may indicate inadequate enteral protein intake.
    - Urea concentrations (after the first couple of weeks of life) that are higher than local laboratory reference ranges (generally 3.5-5.7mmol/L), may suggest the need to reduce protein intake if in the absence of fluid or renal derangements.

2.2 Feeding the Preterm Infant

2.2.1.When to feed the preterm infant & the role of minimal enteral feeds

- There is no clear beneficial effect of MEF of any duration compared to advancing feeds immediately after birth, therefore for most preterm infants, including those considered "high risk" (see below), start enteral feeds as soon as possible after birth and advance as clinically indicated.

Were a decision is taken to commence MEF, ensure that:

- Maternal colostrum is utilised wherever possible
- MEFs are commenced as soon after delivery as possible
- MEF are maintained for no more than 3-7 days
- MEFs are initiated during Indomethicin/Ibuprofen treatment.

2.2.2 Rate of advance of feeding

- In medium and standard risk infants advance feeds at a rate of 30ml/kg/day.
- In selected high risk infants advance feeds at a rate of 20ml/kg/day.

Infants considered high risk should include:

- <28 weeks gestation or <1000g birth weight
- infants re-establishing feeds after an episode of Necrotising enterocolitis (NEC) or following gastrointestinal surgery
- Perinatal hypoxia-ischaemia with significant organ dysfunction
- hypotensive/unstable ventilated neonates
- Absent or reversed end diastolic flow in infants <34 week

Caution should be taken when initiating feeding in the following subgroups. Treatment should be as medium / high risk depending on individual clinical assessment.

- Preterm SGA infants (<2nd percentile and <34 weeks gestation)
- Severe term SGA infants (<0.4th percentile and >34 weeks gestation).
- complex congenital cardiac disease
- dexamethasone treatment
- Indomethecin or Ibuprofen treatment for PDA
- polycythaemic infants

2.2.3 Assessing feed tolerance

- Routine monitoring of gastric residuals in clinically stable infants is not recommended .
- Assessment of GR should be performed only when other clinical signs associated with feeding intolerance or NEC are present such as :
  - Bilious/ bloody aspirates
  - Visual bowel loops/abdominal discolouration.
  - Grossly bloody/watery or abnormal stools
  - Clinically unstable or acute deterioration

2.2.4 Mode of Feed delivery – continuous or bolus feeds?

- There is no evidence to say which method of feeding (bolus or continuous) is best for preterm infants.
- Infants born <32 weeks should receive 1-2 hourly feeds moving to 3 hourly as they grow.
- Four hourly feeds is probably not physiologic in babies receiving human milk and therefore not recommended in the neonatal unit (65)

2.2.5 Management of Gastroesophageal reflux disease (GORD)

GOR is almost universal in preterm infants. It is a physiologic process that will resolve with maturation. Available data does not support the association of the perceived signs of GORD with either acidic or nonacidic reflux episodes in preterm infants. Parents should be reassured that the signs will usually improve with time without treatment.

- No recommendation can be made as to the best method of feed delivery or preferred route of feeding for the management of GOR/GORD.
- Feed thickeners should not be used for the management of GOR/GORD in preterm infants.
- Alginates can be considered, though their longterm effect is unknown.
- Alginates should not be used in conjunction with human milk fortifiers for infants <34 weeks.
- Cardiovascularly stable and monitored infants may benefit from placement in the right lateral position immediately after feeding, followed an hour later by placement in the left lateral position to decrease acid reflux.
- Safe sleep approaches, including use of the supine position on a firm, flat surface, should be the management option of choice for infants >32 weeks gestation who are no longer on monitors and/or with a planned discharge date.
- Pharmacological preparations, including Prokinetics and Proton Pump Inhibitors should be used sparingly in all preterm infants and preferably not all in infants < 34 weeks.
- Where used, proton pump inhibitors administered via an enteral feeding tube must be in a formulation that is appropriate for preventing tube blockage.

Section 3: Types of milk and indications for use (Algorithm 2)

3.1 Human Milk

- Human milk expressed by an infant's own birth parent is the standard of care for all infants born preterm
- All infants should be considered for mouth care in line with the current network guidelines EOE Mouthcare Guidelines

For further information on lactation management in the preterm population, see local

EOE Infant Feeding Guidelines

For information on the handling and storage of human milk, see local guidelines EOE Milk Handling Guidelines

3.2 Human Milk Fortification

- Human Milk Fortifiers (HMF) should be added to human milk for all infants born <1800g once they have tolerated 80- 100ml/kg/day for 24 hours.

- HMF should be used at full strength (1g/25ml milk) from the commencement of fortification for the majority of infants.

- Serum urea concentrations should be monitored regularly (ideally 2x per week) until discharge.

- Standard full fortification is 150 - 165mL/kg/day full strength fortified human milk. If growth is suboptimal on standard fortification, increase volume to 180mL/kg in conjunction with regular serum urea monitoring and ongoing dietetic supervision.

- Adjusted fortification can be considered for infants who growth falter on standard fortification, but only where regular serum urea monitoring is in place and where adequate, dedicated dietetic staff are available to calculate feed composition and monitor progress.

- There is currently insufficient evidence to recommend the use of human milk derived fortifiers.

- HMF should be added to human milk using one of the two recommended processes outlined in appendix 1 of the full guideline.

- HMF should never be added to preterm formula.

- HMF is not recommended if more than half of the feed requirement is provided by preterm formula, though fortification of the human milk component should be considered if there is associated poor growth and tolerance of volume.

- Combination feeds, when required, can be given either:
- Alternating feeds of fortified milk and preterm formula.
- Preterm formula used once the daily supply of expressed human milk has either run out or until the next expression.
- Mixed together if feeds are delivered by continuous infusion, as the fat in human milk is held in suspension and is less likely to coat the sides of the container.

There is little evidence to support one practice over the other, however there is some evidence to suggest mixing human milk with cow's milk formula decreases the number

of lysozymes in human milk and potentially increases E.coli.
The method that involves the least amount of milk handling and is easiest for each unit practice is likely to be the best for individual infants.

3.3 Additional Protein Supplements

- Consider using additional protein supplements as part of an adjusted fortification strategy for infants who fail to grow appropriately on a standardised fortification strategy.
- Additional protein supplements should only be used in conjunction with regular serum urea monitoring.
- Additional protein supplements should only be used under the guidance of a dedicated neonatal dietitian.
- Never add additional protein supplements to unfortified human milk.
- See full guideline for process

3.4 Donor Human Milk (DBM)

See the East of England Donor milk guidelines for supporting evidence and further guidance. EOE Donor Milk Guidelines

- DHM should be used for very preterm (< 32 weeks' gestation) or very LBW (< 1.5 kg) infants when parental milk is either unavailable, contraindicated or insufficient to meet an infant's needs
- DHM may be used for babies >32 weeks gestation or >1.5Kg birth weight, where they meet the additional High Risk criteria in the EoE Nutrition Care Pathway (see section 3.2)
- DHM may be used for late/moderately preterm infants resident on neonatal units or transitional care facilities within the EoE if:
  - They have a birthweight <1.5kg.
  - They meet any of the additional high risk criteria in the EOE Nutrition Care Pathway (see section 3.2).
  - There is a need to "bridge" milk supplies for any late/moderately preterm infant where there is a clear parental intention to establish breastfeeding.
- Babies born <1500g or <32 weeks gestation in receipt of DHM should be given milk that has been fortified with a multi-nutrient human milk fortifier (Nutriprem HMF or SMA BMF) in preference to preterm formula.

- Babies <1800g with a gastrointestinal surgical diagnosis should not receive fortified DHM without discussion with the caring surgical team.

- The use of DHM must be discussed with parents and verbal consent for the use of donor breast milk must be documented in the infant's notes.

- DHM must be sourced from a suitably regulated human milk bank - for units in the EOE this is either the Rosie Milk Bank or the Herts Milk Bank.

- DHM must be stored and handled in line with the EOE Milk Handling Guidelines EOE Milk Handling Guidelines

- When providing DHM, staff must continue, at all times, to raise and maintain awareness of the benefits of a parent's own milk over both DHM and preterm formula. Regular, ongoing support must be made available to parents, in the form of lactation support, in order to ensure maximal volumes of MOM provision and establishment of effective breastfeeding.

3.5 Preterm Formulas

- Preterm formulas can be used for infants born preterm (<37 weeks) with a birthweight <1800g where parental milk/DBM is unavailable or not indicated.

- Feed to a volume of 150-165ml/Kg.

- Do not exceed 150ml/kg SMA Gold Prem 1 or 165ml/Kg Nutriprem 1 without consultation with a neonatal dietitian.

3.6 Extensively Hydrolysed Protein Formulas

- Hydrolysed preterm formulas may be used for early enteral feeding in preterm infants, but only if human milk is not available.

- Term hydrolysed formulas should not be used for preterm infants unless there is a clear clinical indication for use.

- Term hydrolysed formulas should only be used under the direction of a Neonatal Dietitian**.**

3.7 Nutrition post discharge

For ongoing guidance on supporting the nutrition of preterm infants receiving Human milk post discharge. See EOE HMF Post Discharge Guideline

- Formula fed preterm infants born <1800g (including those born LMPT) who at discharge have higher energy requirement or who have had ongoing poor growth should be considered for NEPDF once they are >1800-2000g.

- Formula fed preterm infants not meeting the above criteria should be offered standard term formula at discharge.

- Formula fed, growth restricted term infants >37 weeks should be offered standard term formula at discharge.

There are no specific nutritional recommendations for those infants born moderate to late preterm (LMPT), though requirements are thought to be higher than those of term infants.
Current feeding guidelines for this cohort recommend:

- All late and moderate preterm infants born <1800g need additional nutritional support and should be managed in line with the recommendations within this guideline.

- Parents who wish to breastfeed should be fully supported to do so, both prior and following discharge.

- Infants receiving HMF at home must be monitored closely.

- Iron and vitamin supplementation should be managed in line with current network guidance EOE Vitamin and Iron guideline

3.8 Specialised Term Formulas

- All powdered feeds should be made up in accordance with the East of England ODN milk kitchen guidelines EOE Milk Kitchen Guidelines

- Use of Specialsed formulas put preterm infants at risk of inadequate and inappropriate nutrition and are be used with caution. They should only be used where absolutely necessary and always under the direction of a Paediatric or Neonatal Dietitian.

- Soya formulas are not recommended for infants unless specifically required for treatment of galactosaemia or after discussions with parents, as part of a vegan diet **.**

- Parents should receive training before discharge on how to prepare powdered feeds and clean equipment in line with current national practice.

Section 4: Growth

- Regular monitoring of weight, head circumference and linear length are recommended in line with the parameters outlined above.

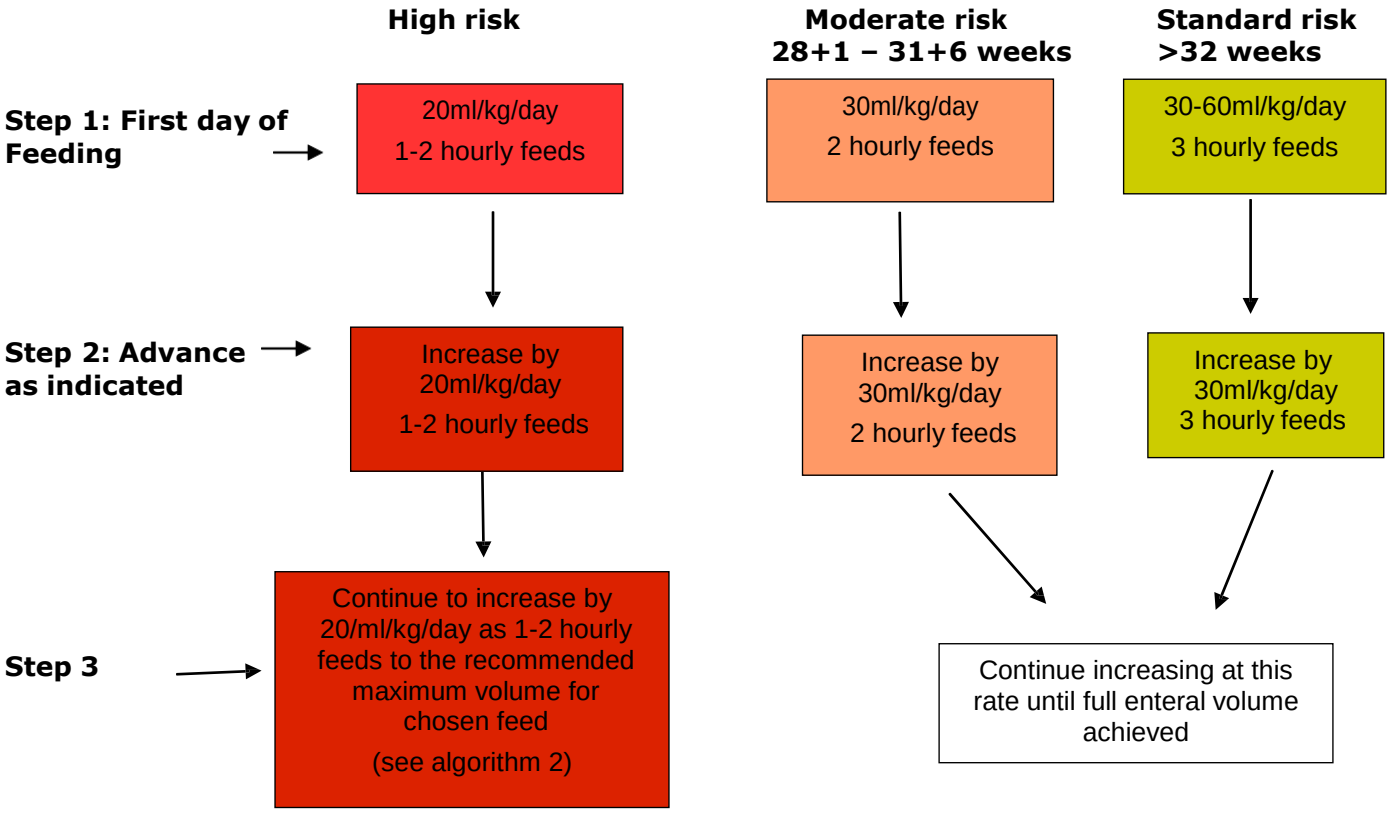
- After an initial weight loss of 7%–10% by day 3-4, nutritional provision should aim to regain birth weight by 7–10 days of age, then follow along a target centile on a neonatal close monitoring chart.

- infants born with in-utero growth restriction (IUGR) and/or small for gestational age (SGA) should receive nutrition and growth management that is the same as those born actual gestational age (AGA)

- Infants with postnatal growth failure should be allowed some catch-up growth. Where catch-up growth is considered too rapid, ensure a nutritional assessment is conducted and that nutrients are within recommended intake ranges.

Algorithm 1 Initiating and advancing enteral feeds.

Use this algorithm in conjunction with algorithm 2 – choice of milk



Commence feeding as close to birth as possible

There is no clear beneficial effect of implementing minimal enteral feeding (MEF) of any duration compared to advancing feeds immediately after birth.

Where a decision is made to initiate MEF, advance as clinically indicated and do not maintain for more than 3-7 days.

Infants can move between risk categories following individual clinical assessment.

High risk defined as:

<28 weeks gestation
< 1000g birth weight
Unstable /hypotensive ventilated neonates
Re-establishment of feeds following NEC or gastrointestinal surgery
Perinatal hypoxia-ischaemia with significant organ dysfunction
Absent or reversed end diastolic flow in infants <34 weeks

Caution should be taken initiating feeds in the following subgroups. The decision to manage as either "high risk" or "moderate risk" is at clinician's discretion.

Severe SGA infants (<0.4th percentile **and** >34 weeks gestation)
Preterm SGA infant (<2nd percentile **and** <34 weeks gestation)
Indomethecin or Ibuprofen for PDA
Complex congenital cardiac disease
Dexamethasone treatment
Polycythaemic infants

Algorithm 2 – Choice of milk

Freshly expressed human milk is the first milk of choice for all infants unless clearly contraindicated

Infants born with birth weight < 1800g

Freshly expressed human milk
Increase as per algorithm 1 to 80 - 100mL/kg
Once tolerated for 24 hrs add full strength HMF

↓

Standardised fortification:
Increase to 150 -165 (180*) mL/kg as per algorithm 1.

↓

Target weight gain** achieved?

↓ **Yes**

Continue :
Standardised fortification
and Growth monitoring

↓ **No**

Consider **Adjusted fortification***

Serum urea <3mmol/L with downward trend?
YES *NO*

↓ *YES*

Add protein

↓ *NO*

Examine alternative reasons for poor growth

*180ml/kg fortified human milk and adjusted fortification strategies should only be considered where regular serum urea monitoring is in place and where adequate dietetic provision is available to provide regular nutritional monitoring.

If insufficient or no parental milk is available fortified donor milk is the next feed of choice for infants meeting the network donor milk guideline criteria. Those infants born<1800g not meeting the network donor milk guideline criteria should be given preterm formula.

Do not exceed 150ml/kg SMA Gold Prem 1 or 165ml/Kg Nutriprem 1 without consultation with a neonatal dietitian

Infants born with birth weight >1800g

Establish breastfeeding / Freshly expressed human milk increasing to 165mL/kg as per algorithm 1

↓

Increase as tolerated to 180 - 200mL/kg EBM if indicated to achieve required growth.

If insufficient human milk is available following lactation support or if parental choice is not to give human milk, offer standard term infant formula.

** Target weight gain

- 20–23 g/kg/d during weeks 23–25 of gestation
- 17–20 g/kg/d during weeks 26–29 of gestation
- 13–17 g/kg/d during weeks 30–34 of gestation
- 10–13 g/kg/d during weeks 35–37 of gestation
- 8-11g/kg/day during weeks 38 -41 of gestation