Waikato District Health Board

Protocol

Enteral Feeding: standardisation of feeding in Newborn Intensive Care Unit (NICU)

Protocol Responsibilities and Authorisation

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Target Audience	Senior Medical officers, Nurse Practitioners/Clinical Nurse Specialists, Registrars, Senior House Officers and Nurses
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Protocol Review History

Version	Updated by	Date Updated	Summary of Changes
1	Joyce Mok, Sally Overington & Arun Nair	Oct 2019	Include the standardisation of feeding as part of the NEC bundle of care, and reviewed by all of the NICU specialists and Paediatric Surgeon
1.1	Arun Nair & Sally Overington	Jan 2020	Table 1: Clarified the risk categories
1.2	Jutta van den Boom	April 2022	Change of feed volume for HMF

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Enteral Feeding: standardisation of feeding in Newborn Intensive Care Unit (NICU)

1 Overview

1.1 Purpose

To outline the protocol for standardisation of enteral feeding in NICU as part of the bundle of care to reduce risks of necrotising enterocolitis (NEC) especially in infants born ≤32 weeks of gestation.

1.2 Scope

Waikato District Health Board (DHB) staff working in NICU

1.3 Patient group

Neonates and infants in NICU

1.4 Definitions

Enteral feeding	Any feeding above 12ml/day is considered to be enteral feeding, and is included in the daily fluid total.
NEC	Necrotising enterocolitis - a severe disease of the intestinal tract, typically involving small and/or large bowel. Most commonly affecting preterm infants.
Tropic feeds	Trophic feeds are a component of feeding, in the earliest days, where the intent is enterocyte stimulation rather than nutrition. Total trophic feeding is a maximum of 12ml/day.
Gastric feed	Feeding via nasogastric (NG) or oro-gastric (OG) tube
Trans-pyloric feeding	Enteral feeds administered by a tube positioned beyond the stomach into the jejunum
Gravity bolus feed	Administration of enteral feed via tube held to allow milk to flow by gravity
Compressed feed	Administration of enteral tube feed via a pump – allowing slower administration of the feed over 30-60minutes
Continuous feed	Administration of enteral tube feed (gastric or jejunal) via feeding syringe pump continuously
Human milk fortifier (HMF)	Feed supplement added to breast milk to provide additional nutrients for premature/low birth weight babies
EBM	Expressed breast milk
Donor EBM	Breast milk expressed from someone other than the birth mother
AF	Artificial formula if birth weight ≥ 2000g
PTF	Preterm formula if birth weight < 2000g
NBM	Nil by mouth: No enteral feeding, except Oral Immune Therapy (OIT)

Oral immune therapy (OIT)	Oral immune therapy is the application of mother's breast milk to the babies oral mucosa, by cotton bud application, at very small volumes (<1 ml, 4 hourly). This therapy is generally indicated in all conditions, irrespective of NBM status.
Preterm infants	Babies born before 37 completed weeks gestation
SGA	Small for gestational age
ELBW	Extremely low birth weight < 1000g
VLBW	Very low birth weight 1000 -1500g
PRN	As required
SMO	Senior Medical Officer

2 Clinical Management

2.1 Protocol

2.1.1 Initiating and advancing enteral feeding

Enteral feeds in preterm infants

- Commence feeding as close to birth as possible, preferably within the first 24 hours, following individual clinical assessment.
- Feeding of premature babies <32 weeks starts small and builds up, often over many days, depending on tolerance.
- Reasons for maintaining babies on NBM:
  a) NEC for 10 days
  b) Indomethacin treatment – whilst ductus remains open
  c) Asphyxia – for first 3 days, while being cooled
  d) Surgical conditions of the intestine, at direction of surgical team
  e) Other situations at the discretion of in-charge SMO

Assessment:

- Prevention strategies for NEC should begin at birth
- Assign risk categorisations at admission (refer to Categories of risks 2.1.2.).
- Daily individual assessment for tolerance and decisions made about continuation of trophic feeding or standard advancement of feeds as recommended for the risk categories (Infants can move between risk categories following individual clinical assessment).
- Growth monitoring – Fenton Growth Charts
  - Alternate day weighs or daily at SMO discretion
  - Weekly head circumference and length

2.1.2 Categories of risks for NEC

Table 1: Categories of risks for NEC

High risk infant	Moderate risk (can be managed as high risk at clinician's discretion)	Standard risk
• <28^0 weeks Gestation And / Or ○ Birth Weight <1000g ○ Re-establishing feeds after NEC or gastrointestinal surgery ○ Perinatal hypoxia-ischaemia with significant organ dysfunction ○ Hypotensive/unstable ventilated neonates ○ Absent or reversed end diastolic flow in infants ≤32 weeks	▪ 28^0–32^6 weeks Gestation And /Or ○ Birth Weight 1000 to 1500g ○ Complex congenital cardiac disease ○ Dexamethasone treatment ○ Indomethacin or Ibuprofen treatment for PDA ○ Polycythaemic infants	• ≥33^0 weeks Gestation And ▪ Birth Weight >1500 g

Adapted & modified from East of England enteral feeding guideline March 2018

2.1.3 Feeding regime (see Table 2)

1. **Trophic Feeding**
   - Should commence as soon after delivery as possible where the intent is enterocyte stimulation rather than nutrition
   - Will preferably be breast milk (or colostrum), but may include formula milk at parental discretion.
   - Any feeding up to 12 ml/day is considered trophic, and the volume is not included in the total daily fluids.
   - Start with 1 ml 4 hourly and increase to 1 ml 2 hourly
   - Maximum volume: 12ml/day

2. **Feeding escalation:**
   - Any feeding above 12ml/day is considered to be enteral feeding, and is included in the daily fluid total.
   - In babies at high risk escalate at 20 ml/kg/day, with regular review to determine satisfactory tolerance. In babies at moderate or standard risk, escalate at 30 ml/kg/day, with regular review to determine satisfactory tolerance.
   - Feed volumes of < 10 ml are charted to the nearest 0.5 ml interval. Feed volumes of > 10 ml are charted as integer volumes (round up to the nearest whole ml).

3. **Standard feeding frequency:**
   - 2 hourly if < 1500g
   - 3 hourly > 1500g
   - 4 hourly to be considered when weight is > 2500g

4. **Mode of feeding**
   - The standard method of feeding is by gravity bolus, via NG or OG tube.
   - Feedings can be given more gently by slow compressed feed over 30 or 60 minutes, if there are signs of intolerance
   - Feedings can be given even more gently by continuous pump infusion, if there are signs of intolerance (Abdominal distension compromising respiration, recurrent vomits, > 50% residual volume if aspirated etc.)
   - Trans-pyloric feeding: It may be necessary in rare circumstances to use this form of feeding, it should be given continuously by feeding syringe pump. Generally avoid or use only where deemed clinically appropriate. Do not add any medications or supplements to transpyloric feeds.

5. **Milk**
   - Mother's own breast milk is the greatest preference.
   - EBM stored for the baby's later use must be placed in the freezer with label, date, time and sequence number clearly attached. For babies of gestation < 30 weeks, the EBM is to be used in order of sequence number for the first 4 weeks.
   - Mothers may choose to provide breast milk for their baby from an alternative source of their choosing. Refer to Waikato DHB Medical Procedure: Use of Donor Breastmilk in the Newborn Intensive Care Unit (5926).
   - Breast milk from a donor breast milk bank, appropriately sterilised. *(At present this option is not available)*
   - Infant formula, preterm formula (PTF) for infants <2000g or artificial formula (AF) is to be used in place of or in combination with breast milk when adequate amounts of breast milk is unavailable.

- Verbal parental consent is required prior to initiation of any form of formula milk, including AF, PTF, as well as HMF. This discussion must be documented in the nursing notes. (See Appendix A for Alternative Formula Milks)

6. Human milk fortifier

- To be advocated for in preterm infants < 32 weeks at birth when feeding of predominantly breast milk reaches a feed volume of 8ml per feed q2h
- Can only be added to EBM
- If feeding is more than 50% formula, then HMF is not required.
- Add HMF only if available EBM volume is sufficient for one feed
- If EBM volume is not enough for one feed, then use formula (PTF or AF as appropriate). *(Do not mix EBM with formula if EBM is fortified with HMF)*
- If tolerance is sub-optimal, then can use ½ quantity of HMF instead.
- Refer to Waikato DHB NICU Nursing Procedure: Fortification of Breast Milk (3197) for administration guidelines.

7. Formula milk fortification

- Formula may be concentrated following discussion with the dietician.

8. Vitamins and minerals

- Refer to Waikato DHB NICU Medical Protocol: Newborn vitamin and mineral requirements (1526).

9. Daily and PRN Assessment for intolerance and/or NEC:

- Do not routinely aspirate to check for feed intolerance, unless there is a clinical indication, e.g. if aspirate testing for position is green or bloody.
- Possible signs of intolerance:
  - Vomiting
  - Abdominal distension/increasing abdominal girth
- Suspect NEC:
  - Bilious/ bloody aspirates or a spill/vomit
  - Visual bowel loops/abdominal discoloration
  - Bloody/watery or abnormal stools
  - Clinically unstable or acute deterioration with the above signs and symptoms

Table 2: Algorithm for Initiating & increasing feeds*

High risk	Moderate risk	Standard risk
Step 1		
Trophic Feeding Up to 12ml/day 2 hourly trophic feeds	Up to 30ml/kg/day 2 hourly feeds	Up to 30-60ml/kg/day 2 - 3 hourly feeds
Step 2		
Advance as tolerated Increase by 20ml/kg/day 2 hourly feeds (Once daily Increase) Add HMF to EBM on reaching a feed volume of 8ml q2h	Increase by 30ml/kg/day 2 hourly feeds Add HMF to EBM on reaching a feed volume of 8ml q2h	Increase by 30ml/kg/day 2 - 3 hourly feeds
Step 3		
Continue to increase by 20ml/kg/day until 180ml/kg/day 2 hourly feeds	Continue increasing at this rate until full enteral volume achieved	

* The shortfall in total fluid volume to be made up with TPN, unless it is considered that there is no need for a central line, in which case continue Dextrose 10% till full oral feed volume is reached.

- Interventions if signs of intolerance present:
  - Medical review
  - Consider septic screen and/or abdominal x-ray, abdominal ultrasound and surgical consultation
  - Consider continuing with trophic feeds rather than nil by mouth till confirmation of the diagnosis of NEC

2.2 Potential complications

- Poor weight gain
- Delay in establishing feeds

3 Audit

3.1 Indicators

- All infants are risk rated for NEC on delivery / admission as per 2.1.2
- The algorithm for initiating and increasing feeds (Table 2) is followed for enteral feeding
- Accurate and up to date fluid balance documentation is available for all infants on enteral feeding

4 Evidence base

4.1 References

- Oddie SJ, Young L, McGuire W. (2017). Slow advancement of enteral feed volumes to prevent necrotising enterocolitis in very low birth weight infants. Cochrane Database of Systematic Reviews 2017, Issue 8. Art. No.: CD001241. DOI: 10.1002/14651858.CD001241.pub7.)
- Watson J, McGuire W. (2013). Transpyloric versus gastric tube feeding for preterm infants. Cochrane Database of Systematic Reviews 2013, Issue 2. Art. No.: CD003487. DOI: 10.1002/14651858.CD003487.pub3.Review)
- Radbone, L. (2018). East of England Neonatal Network Enteral Feeding of Preterm Infants on the Neonatal Unit. Retrieved March 29, 2019 from www.nnuh.nhs.uk/.../enteral-ffeding-of-preterm-infants-regional-network-document/

4.2 Associated Waikato DHB Documents

- Waikato DHB Medical Procedure: Use of Donor Breastmilk in the Newborn Intensive Care Unit (5926).
- Waikato DHB NICU Medical Protocol: Newborn vitamin and mineral requirements (1526).
- Waikato DHB NICU Nursing Procedure: Enteral Feeding in Newborn Intensive Care Unit (NICU) (4945)
- Waikato DHB Nursing Procedure: Fortification of breast milk (3197)
- Waikato DHB Medical Procedure: Oral Immune Therapy in NICU (6169)

Appendix A – Alternative Formula Milks

Alternative formula milks are available for specific situations as follows

(Prior discussion with the dietician is needed before prescribing formulae other than AF & PTF)

Milk	Characteristic	Kcal/100ml	Indication
WHIF	Standard	66	Standard
PTF	Lactose 50%, more energy	81	Preterm
Peptijunior	Hydrolysed protein, lactose-free	67	Short bowel
Neocate	Amino acids, lactose-free	71.3	Short bowel
Monogen	Fat = 93% MCT.	74	Liver disease, Chylothorax
Infantrini	High Calorie Feed	100	Poor Weight Gain