MANAGEMENT OF ENTERAL FEEDING

Introduction
Adequate nutrition is essential for appropriate growth and development of the neonate. Please see feeding protocol for further information regarding the guidelines for introduction and establishment of enteral feeding in the preterm infant.

The oro gastric route is the preferred method for inserting intra gastric tubes. This applies to intra gastric tubes used for drainage of gastric secretions, gastric decompression and enteral feeding. Although the naso gastric route may be appropriate in the management of some infants with complex needs, the use of oro gastric tubes is favoured in the presence of respiratory distress, prematurity (Martin et al., 1989; Stock, 1980) and neonatal abstinence syndrome.

1. Infants who are nil by mouth and / or ventilated
For infants less than 28 weeks gestation who are nil by mouth and /or ventilated (including CPAP) a 5Fg intra gastric tube is inserted, secured and placed on free drainage. This is to ensure that air does not accumulate in the stomach resulting in respiratory compromise (Yu, 1975) and / or discomfort. The intra gastric tube is aspirated 4th hourly using gentle pressure.

For larger and more mature infants who are ventilated or infants with an acute abdomen an 8Fg intra gastric tube is inserted and the aspirate discarded if excessive or abnormal. For infants with a Tracheal Oesophageal Fistula (TOF) insert a size 10 repogle tube into the proximal oesophageal pouch and place on low suction (~ 5kpa) to minimise the risk of aspiration – see Protocol for the management of oesophageal atresia and tracheoesophageal fistula.

Infants admitted with acute respiratory distress and managed in head box oxygen do not require the routine placement of an indwelling intra gastric tube until enteral feeding is commenced.

2. Change of intra gastric tubes
Infants often develop apnoea and / or bradycardia during the insertion of intra gastric tubes as vagal receptors are stimulated (DiPetro and Porges, 1991; Haxhija et al., 1994; Van Someren, 1984). If intra gastric tubes are passed over 10-15 seconds the vagal response can be reduced (Haxhija et al., 1995) but infants may still be at risk of trauma (Engum, 1996; LaGamma and Brown, 1994). Nurses have proposed the rationale for routine tube change is to reduce infection and prevent the tube from embedding in the stomach wall (Rogahn, 1998), however there are no published studies to recommend the length of time a PVC tube can be safely left insitu. The manufacturers (Sherwood Argyle and Vygon, UK) as cited in Rogahn recommend PVC tubes can be changed every 3-4 days but not remain insitu for more than seven days. This unit has therefore taken the pragmatic approach of changing PVC tubes every four days with routine bathing. If the infant is unstable PVC tubes may be left insitu for up to 7 days (Mears, 2001).
3. **Intragastric feeding**

Intragastric tubes are also used for infants who are unable to suck and/or who require small frequent feeds. Milk is routinely administered by bolus every hour or less frequently as determined by infant’s gestation, postnatal age, risk factors and general condition – see feeding protocol.

3.1 **5Fg intra gastric tubes**

These tubes may be left insitu and are used for infants on enteral feeds nursed in an isolette. Feeds are routinely delivered as an intermittent bolus rather than continuous infusion (Schanler et al., 1999). In addition it has been demonstrated that EBM delivered by slow infusion will result in dilute, low calorie feeding (Brennan-Behm et al., 1994; Greer et al., 1984; Stocks et al., 1985) as lipids adhere to the lumen of infusion tubing.

3.2 **8Fg intra gastric tubes**

These tubes are used for larger and more mature infants who are on third hourly or less frequent regimens and nursed in a cot. These tubes are inserted intermittently and feeds are delivered using gravity and removed after the feed. It is also more practical to deliver thickened feeds through these wider tubes using the intermittent bolus slow push method.

3.3 **Key issues**

- Formula and breast milk may be kept at room temperature for up to four hours (Igumbor et al., 2000)
- Feeds are given at room temperature or warmed immediately before administration – studies have not demonstrated that feed temperature affects feed tolerance or thermoregulation (Blumenthal et al., 1980; Eckberg et al., 1987; Gonzales et al., 1995).
- Infants to have intra gastric tubes removed prior to oral feeding (Shiao et al., 1996)
- Parents may tube feed their infant after a registered nurse has verified the position of the intra gastric tube
- Parents who tube feed must be supervised by a registered nurse at all times

3.4 **Procedure – Insertion of Oro gastric / naso gastric tube**

**Equipment for insertion of intra gastric tube**

<table>
<thead>
<tr>
<th>Clean</th>
<th>Sterile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean dressing trolley with alcohol solution, leave one minute &amp; wipe dry</td>
<td>size 5Fg or 8Fg intra gastric tube</td>
</tr>
<tr>
<td>Gloves</td>
<td>2 ml syringe &amp; litmus paper</td>
</tr>
<tr>
<td>comfeel (indwelling tubes)</td>
<td>stethoscope</td>
</tr>
<tr>
<td>white tape (indwelling tubes)</td>
<td>yellow top specimen jar for gastric aspirate and / or receptacle for free drainage or</td>
</tr>
<tr>
<td></td>
<td>syringe &amp; enteral feed</td>
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</tbody>
</table>

Observe all preliminary procedure standards appropriate to this procedure as detailed in the nursing preface of this manual.
• Pre cut tapes / Comfeel (Coloplast) prior to disturbing / handling infant
• Leave intra gastric tube in packet and attach 2 ml syringe

For naso gastric tube insertion - measure from the nose to ear lobe to midway between xiphoid process and umbilicus – see picture (Weibley et al., 1987)

For oro gastric tube insertion - measure from corner of mouth to ear lobe to midway between xiphoid process and umbilicus – see picture (Weibley et al., 1987)

• Insert tube over 10-15 seconds to limit possible vagal stimulation (Haxhija et al., 1995)
• When infant has recovered, aspirate and test aspirate with litmus paper – if return is acidic, tube is correctly positioned secure (comfeel & tape) and / or proceed with feed if appropriate

If no aspirate is returned - auscultate over the stomach while inserting 1ml air - if tube is correctly positioned secure and / or proceed with feed if appropriate

• Document and sign date / time of tube insertion on weight chart

• Document gastric return / feed volume and infant’s response to procedure

• **Gastric aspirates**

  The amount and type of aspirate is documented and returned to prevent loss of fluid, electrolytes and conserve immunoglobulin levels (Bragdon, 1983; Hodges & Vincent, 1993). The aspirate should only be discarded if blood or bile stained or if there are excessive amounts that require electrolyte and fluid replacement.

  In addition to the ongoing assessment of infant wellbeing, the measurement of gastric residuals to determine enteral feed tolerance is not only widely documented in the literature (Anderson & Kliegman, 1991; Blumenthal et al., 1979; Enriquez et al., 1998; Kuschel et al., 2000; Rayyis et al., 1999; Yu, 1975) but is routine in practice. The volume of gastric aspirate is measured and documented every 4-6 hours and assists to monitor progress of feeds. Infants with gastric residuals in excess of 25% of the total volume of feeds given over the previous four hours are reassessed and carefully observed for other signs of feed intolerance (Kuschel et al., 2000).

*Observe all post procedure standards appropriate to this procedure as detailed in the nursing preface of this manual*

3.5 **Feed intolerance**

If the following gastro-intestinal signs are observed in any infant

- increased abdominal girth
- abdominal distension.
- bile stained gastric aspirates.
- large aspirates that is > 1/3rd of the total volume delivered over the previous four hour period
- visible blood in the stools
- visible distended loops of bowel over the abdomen,
- temperature instability or increasing apnoea further medical assessment is indicated

4. **Administration of expressed breast milk**

To ensure safe practice within the nurseries it is necessary for all expressed breast milk to be "double checked" by two nurses, one of whom must be a registered nurse. *Viruses can be transmitted via breast milk - therefore administration of the wrong milk to an infant is considered a serious clinical error and must be immediately reported to the neonatologist on 1st call and the nurse in charge of shift*. An incident form must be completed. See policy - *Error in Breast Milk Administration* - for further information and guidance.

4.1 **Identification of breast milk**

- It is essential that all breast milk is labelled and stored correctly. See section two of this
policy – *Use and storage of expressed breast milk.*

- There is a separate yellow container in the fridge to store each infant’s expressed breast milk. All containers are to have an infant’s MRN sticker attached.
- Expressed breast milk in plastic containers or bottles is to have an infant MRN sticker applied to the container and
- Expressed breast milk in syringes is to have the infant MRN sticker directly attached to each syringe.
- Expressed milk may not be checked against a maternal MRN sticker
- *If there are two infants in the nursery with the same or similar last names,* a label stating – *special note there is another patient with the same or similar name CHECK!* - must be attached to:
  - both infants’ isoletes / cots
  - both infants’ storage bins in the fridge
  - all breast milk containers / syringes
  - both infants’ IV / feeding charts

**N.B. Please ensure all mothers are aware of the potential risk and all have an adequate number of labels to identify their milk.**

- Milk should not be used if there is inappropriate identification and / or where infant records are incomplete
- Maternal MRN stickers cannot be used to check milk.
- The nurse caring for the infant must ensure the mother has enough infant MRN stickers to ensure correct labelling of her breast milk.

**Before using breast milk –**

- Check name, infant’s medical record number, date and time of collection / defrosting on the breast milk container against infant's name-tag.
- Prior to removing milk from the fridge it may be necessary to further decant the breast milk into a second container. This will also require an infant identification sticker and this procedure must be witnessed by a second nurse. Both nurses are then to sign the container.
- Other information such as additives and date / time of preparation must also be documented on the container.
- The two signatories must sign the feed, intravenous or intensive care charts when the milk is given. Prepare enough milk for no more than 8 hours use. Milk may be only left at room temperature for 4 hours.
- Providing the container of decanted breast milk has been correctly labelled, signed by two nurses and other relevant information has been documented, milk from that container may be given to the infant by any attending nurse.
- Prior to each feed check name and infant medical record number on the container against infant's name-tag with a second nurse / mother and sign feeding chart.
- On occasions when the mother has recently expressed milk and wishes to give it to her infant immediately, the nurse accepting the milk and the mother may sign for it on the feed chart.

**4.2. Use and storage of expressed breast milk**

RPA Women & Babies Centre for Newborn Care – May 2004
All midwives and nurses who handle breast milk should take care as it is body substance and as such can transmit disease (Dougherty & Giles, 2000; Ruff, 1994).

- Breast milk is stored in a sterile plastic sealed container with the infant’s MRN sticker, date and time of collection clearly written on the lid.

- If syringes are used to store milk then the hub of the syringe must be sealed and infant’s MRN identification label attached to the barrel of the syringe.

- Mothers expressing for infants < 30 weeks should store their EBM in syringes until there are at least 20 x 2ml syringes available. This should reduce waste while minimal enteric feeding progresses.

- Any concerns about current maternal medication and use of EBM should be discussed with the neonatologist. Further information is available from the high-risk parenting and lactation nurse specialist (page 80354), RPA Drug Information Service (ext 58145) and resource material in the NICU (Hale, T.W. (2002) Medications and Mothers’ Milk).

- Breast milk may be stored in the fridge proper (not the door) for up to 48 hours following collection provided temperature remains < 4°C (Binns & Davidson, 2003). If use within 24 hours is not anticipated then the milk should be frozen. Breast milk can be stored up to 6 months in a deep freeze at -18°C and in a fridge freezer for up to three months (Lawrence, 1994). Breast milk can only be safely stored for two weeks in the compartment section of a fridge (Igumbor et al., 2000; Binns & Davidson, 2003).

- Fortified EBM should be used within 8 hours and not frozen (Jocson et al., 1997).

- Plan ahead as frozen breast milk should be thawed gradually in warm water, shaken to mix separated components and used within 24 hours of removal from freezer (Hamosh et al., 1996). Label container with date and time milk has been taken out of freezer.

- If milk is quickly thawed and heated for immediate use it must be used within 4 hours and any unused portion discarded.

- If the infant is very premature advise mother to store her breast milk in small quantities so none is wasted when thawing and using.

Evidence suggests that fresh (unfrozen) breast milk should be used when available and used in preference to thawing frozen milk stocks (American Academy of Pediatrics, 1985; Hamosh et al., 1996; Williamson & Murti, 1996).

4.3 Introduction to the breast
Infants should be given the opportunity to suckle at the breast (non-nutritive breast cuddles) when the infant is stable (usually around 31 weeks post menstrual age), can tolerate periods out of the isolette and the mother is comfortable with the practice (Bosque et al., 1995). There is no minimum weight or gestational age criteria however it is important for the nurse to observe the infant’s response to handling and discuss infant cues with the mother that may suggest fatigue or readiness to commence nutritive sucking – see breast feeding protocols.

Breast-feeding is less physiologically demanding than bottle feeding (Blaymore – Bier et al., 1993; Bosque et al., 1995 Meier & Anderson, 1987) so there is no evidence to suggest that infants should bottle feed before progressing to breast feeding. All infants whose mothers are expressing should be offered the breast prior to any attempt at a bottle feed. It is always preferable to establish 2-3 breast feeds at a schedule suitable to the mother, before an infant is introduced to bottle feeds. Bottle feeding may be appropriate if the infant is alert and demanding and the mother is not available for feeding. This should always be discussed with the mother prior to the need for a bottle feed intervention.

Although studies with oro gastric tubes insitu during oral feedings have not been performed, one study (Shiao et al., 1996) demonstrated an increased number and duration of oxygen desaturations, shortened sucking bursts and decreased milk intake when naso gastric tubes were left insitu during oral feeds. Logically the placement of oro gastric tubes may also interfere with sucking ability and optimal milk intake and therefore should be removed for oral feed.

### 4.4 Bottle feeding

Some mothers may choose or not be able to breast feed their preterm infants. It has also been our experience that some mothers express but do not wish to breast feed and elect to give their EBM via a bottle. All these require support and guidance with their bottle feeding experience. The type of formula used will be dependent on the unique requirements of their infant – see table below, feeding and prevention of atopy protocols for further information. Introduction to bottle feeds should be gradual and based on the infant’s cues – readiness to suck, development of suck-swallow coordination and physiologic stability – see breast feeding protocols for bottle feeding infants with special needs. The ability to remain physiologically stable occurs earlier for breast feeding preterm infants compared with those who bottle feed Blaymore – Bier et al., 1993; Bosque et al., 1995; Meier & Anderson, 1987) therefore first attempts by mother and infant to bottle feed should be supervised by the neonatal nurse.
4.5 Preparation of enteral feeds

The registered nurse in charge of each shift must ensure the formula room is clean and hygienic at all times. Formula may be prepared up to 24 hours in advance and must be labeled and dated. Formula may be left at the infant’s bedside for up to four hours (Igumbor et al., 2000).

Observe all preliminary and post procedure standards appropriate to this procedure as detailed in the nursing preface of this manual.

Formula preparation or addition of fortifiers to breast milk must be performed according to the manufacturer’s direction using sterile utensils. If the nurse has concerns please speak with the lactation specialist (page 80354) or nurse in charge of shift. Nurses should utilize every opportunity to teach parents appropriate feed preparation and storage practices.
Infants with special needs – adapted from Product Information for Professionals (Nutrica, Wyeth, Nestle 2001)

<table>
<thead>
<tr>
<th>Indication</th>
<th>Product</th>
<th>Comments – (product in use)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants $\geq$ 32 weeks or 1500g admitted to the neonatal nurseries</td>
<td>standard whey dominant formula</td>
<td>used when mother has elected to formula feed or there is an insufficient supply of EBM – (S26 Gold ready to feed, Wyeth)</td>
</tr>
<tr>
<td>Infants &lt; 32 weeks or 1500g</td>
<td>low birth weight formula</td>
<td>as above- contains additional vitamins, sodium, calcium, phosphate, LCPUFAs to meet preterm infant needs – (PreNan, Nestle)</td>
</tr>
<tr>
<td>Infants &lt; 32 weeks or 1500g</td>
<td>human milk fortifier</td>
<td>used to fortify maternal breast milk – provides additional calories, vitamins, calcium, phosphate and sodium – (S26 HMF, Wyeth)</td>
</tr>
<tr>
<td>Parent or sibling with atopic disease</td>
<td>hydrolysed whey formula</td>
<td>See policy prevention of atopy – (NAN – HA Nestle)</td>
</tr>
<tr>
<td>Feed intolerance</td>
<td>hydrolysed whey formula</td>
<td>when infant not tolerating formula or EBM usually post surgical (Pepti Junior, Nutricia)</td>
</tr>
<tr>
<td>Post surgery – short bowel syndrome / prevention of atopy</td>
<td>Hydrolysed amino acid &amp; lactose free formula</td>
<td>usually ordered by surgeon until breast milk can be re established (Neocate, SHS)</td>
</tr>
<tr>
<td>Lymphatic disorders</td>
<td>formula high in MCT</td>
<td>most often used for chylothorax until breast milk can be slowly introduced – (Monogen, Nutricia)</td>
</tr>
<tr>
<td>Galactosaemia / post surgery lactose intolerance</td>
<td>lactose free formula</td>
<td>- (Pepti Junior, Nutricia; De-Lact, Nutricia)</td>
</tr>
<tr>
<td>PKU</td>
<td>phenylalanine free formula</td>
<td>(XP Analog, Nutricia)</td>
</tr>
<tr>
<td>Assist infants breast feeding with reflux problems</td>
<td>Food thickener</td>
<td>(Food Thickener, Karicare) use with caution in the preterm infant – discuss concentration with neonatologist on duty</td>
</tr>
<tr>
<td>Additional calories – slow growth</td>
<td>glucose polymer</td>
<td>(Polyjoule) 5ml (one level teaspoon) to 50mls formula / EBM = 25kcal/30mls</td>
</tr>
<tr>
<td>Absorption or transport of LCT is impaired / additional calories needed for poor growth</td>
<td>Medium chain triglycerides</td>
<td>(MCT oil, Nutricia) – 9kcal/ml &amp; given as 1gm/kg/day (1gm=1ml) &amp; slowly ↑ to 4gm/kg.day</td>
</tr>
</tbody>
</table>

4.6 Guidelines for initiation and and grading up of enteral feeds – see feeding protocols.

4.6.1 Initiation of enteral feeds

- Well babies born at 32 completed weeks’ gestation, that is 33 weeks, may commence on full enteral feeds.
• Well babies born before 32 completed weeks, that is less than 33 weeks’ gestation should have an IV inserted to facilitate a slow increase in enteral feeds.

• Babies less than 31 completed weeks, that is less than 32 weeks or 1500 grammes should have breast milk supplemented (S26 HMF Wyeth) when 150mls/kg/day is reached and tolerated for 24 hours.

• Babies less than 31 completed weeks, that is less than 32 weeks or 1500 grammes should receive preterm formula (PreNan, Nestle).

• Sick babies born after 28 completed weeks, that is 29 weeks’ gestation have enteral feeds commenced when clinically appropriate after discussion with the neonatologist.

• Babies born before 29 weeks gestation, that is less than 28 completed weeks should have minimal enteric feed commenced 0.5 – 1 ml every four hours on day 2-3 after discussion with the neonatologist on duty.

4.6.2 Volume & Caloric load of feeds in babies fed with milk from birth

• Day 1 – 60mls/kg
• Day 2 – 90mls/kg
• Day 3 – 90mls/kg
• Day 4 – 120mls/kg
• Day 5 – 120mls/kg
• Day 6 – 120mls/kg
• Day 7 – 150mls/kg (100kca/kg/day)

4.6.3 If less than 30 weeks gestation at birth

• When tolerating 150mls/kg/day (EBM) for 24 hours add S26 HMF (Wyeth) 24cal/30mls.
• When tolerating 150mls/kg/day (EBM) and S26 HMF (Wyeth) and / or preterm formula for 48 hours (120kcal/kg/day) grade to.
• 180mls/kg/day in three daily increments of 10mls/kg/day (144kcal/kg/day). Observe for feed tolerance and adequate weight gain.

4.6.4 Phototherapy

• Add 15% if the babies is under phototherapy.

4.6.5 Neonatal abstinence syndrome

• May have regime for phototherapy if assessed to be hungry – discuss with nurse in charge of shift and document rationale. Evaluate management within 24 hours and document

4.6.6 Frequency of feeds
Nurses assess the readiness for infants to progress and should consider behavioural infant’s cues, physiologic stability, weight gain and gastric residuals before decreasing frequency of feeds. Changes to volume and caloric load outside of protocol should be discussed with Neonatologist on duty.

Guide

- **1250 – 1500g** grade to second hourly feeds
- **1500 – 1800g** third hourly if tolerated
- **>1800g** frequency will depend on reason for admission to nursery
- when preterm infants reach 1800 grammes consider changing from preterm to standard term formula and ceasing breast milk fortification – discuss with neonatologist on rounds.

4.6.7 Modification to policy

There are many instances when modification to these guidelines should be made and discussion with team initiated:

- birth asphyxia / central nervous system anomaly
- IUGR i.e. < 3rd percentile
- slow weight gain
- electrolyte imbalances
- hypoglycaemia
- chronic O2 dependency
- NEC
- feed intolerance

4.7 Supplements

4.7.1 Vitamins

- Infants receiving preterm formula or fortified EBM do not require vitamin supplementation
- Preterm infants not receiving fortified EBM require vitamin supplementation from 7 days or when enteral feeds have been tolerated for 48 hours.
- Preterm breast fed infants should be supplemented with a multivitamin on discharge (Pentavite 0.45mls daily) and continued for 3-4 months, when reviewed by paediatrician.
4.7.2 Iron

- Infants less than 2000 grammes should receive iron supplementation until 3-4 months corrected age when reviewed by paediatrician.
- Commence Fergon (6.5mg/ml iron) on day 42 – 0.5ml 12th hourly with food.
- Possible side effects include constipation and gastric irritation.

4.7.3 Polyjoule

- A glucose polymer that provides additional carbohydrate to increase calories.
- There is little increase in osmolality, negligible sodium or potassium content.
- Observe for loose stool and peri anal excoriation which may indicate fast gut transit time
- For preparation instructions – see table infant with special needs.

4.7.4 MCT Oil

- Medium chain triglycerides – medium chain fatty acids.
- May be used for low birth weight babies, to provide extra calories, or where there is a fat malabsorption e.g. cystic fibrosis.
- Can have an osmotic effect, introduce slowly – observe for loose stools.
- 9kcal/ml
- Give as 1gm/kg/day (1gm in 1ml) and increased 1gm/kg/day until having 4gm/kg/day.

References


For oro gastric insertion measure from glabella to xiphoid process – see picture (no reference found)