GUIDELINE

Fluid and Nutrition Requirements, and Enteral Feeding

Scope (Staff):	Nursing and Medical Staff
Scope (Area):	NICU KEMH, NICU PCH, NETS WA

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations.

Read the full statement here:
CAHS Child Safe Organisation Commitment Statement

This document should be read in conjunction with this disclaimer

Also refer to Parenteral Nutrition, and Nutrition Room Protocols

Contents

Aim

To outline volume, nutritional requirements and the initiation and progression of enteral feeding within the neonatal unit.

Risk

Neonates require adequate nutrients from their prescribed fluid intakes to maintain normal concentrations of blood and tissue nutrients and to grow well. Meeting these nutrient requirements is challenging and large nutritional deficits can occur resulting in faltering growth leading to less favourable neurodevelopment and other long-term health outcomes. Standardised feeding schedules improve neonatal outcomes.

Key points

- Volume requirements are to be re-calculated each shift to ensure the volume being given is the same as the volume ordered.
- Check enteral and IV volumes considered in the total fluid calculation have been titrated accurately for infants receiving both IV fluids and enteral feeds. Note that IV lipid is not included in total fluid calculations and some IV medications may also be excluded from total fluid calculations.
- The 24-hour volume totals are tallied at 12 midnight and adjustments to requirements are made as needed. Infusions not included in the daily total are lipids and blood products.
- IV solutions must be double checked by two nurses at the bedside and labelled with the solution, date/time, infant's name, UMRN and DOB and persons checking.
- EBM and PDHM must be double checked by two nurses at the bedside and labelled with the infant's name, UMRN and DOB. Decanted milk must also have the initials of the nurses checking the milk out of the fridge and have the date and time the milk was taken out of the fridge. In open nursery areas the decanted milk is to be kept to the right of the infants monitor.

Volume and Glucose requirements

- Infants require sufficient fluid volumes to promote optimal hydration, normal concentrations of blood and tissue nutrients, and adequate growth.

Day 1 Fluids	
• Term infants	• 60 mL/kg/d
• Preterm infants born >25 weeks gestation	• 80 mL/kg/d
• Preterm infants born <25 weeks gestation	• 100 mL/kg/d

- Some infants may require fluid restriction 40-50ml/kg/day, always ensure appropriate glucose delivery to achieve PGL>3.5 is calculated e.g. Infants with significant hypoxic ischaemic encephalopathy.
- Where there are abnormal fluid losses (gastroschisis, gastric or drain losses or diarrhoea) an adequate volume with similar composition must be replaced in addition to the prescribed solution.

- Nutritional requirements are as follows:

<table>
<tr><th colspan="2">IV Glucose Solutions</th><th>Oral Feeds</th><th>TPN</th></tr>
<tr><td><25 weeks</td><td>Glucose 2.5% - 5%</td><td rowspan="3">GASTRIC TUBE FEEDS
(EBM / PDHM/formula)</td><td rowspan="3">Refer to Parenteral Nutrition (PN) guideline if starting on TPN</td></tr>
<tr><td>>25-< 27 weeks</td><td>Glucose 5%</td></tr>
<tr><td>≥ 27-34 weeks</td><td>Glucose 7.5%
1/5 N/S</td></tr>
<tr><td>> 34 weeks</td><td>Glucose 10%</td><td>BREAST / BOTTLE
(EBM / formula)</td></tr>
<tr><td colspan="4">See Standardised Enteral Feeding Schedule below for starting volumes/milk type</td></tr>
</table>

- Unless contraindicated, increments are increased progressively at 20 mL/kg/day to an optimal target range of 150-170 mL/kg/day. Fluids are calculated on the infant's birth weight until the birth weight has been reached.
- Review requirements daily, alterations may be needed depending on the infant's clinical state, abnormal weight loss or gain, degree of renal wasting and electrolytes supplied in other infusions/drugs. A predicted/ estimated 'working' weight may be used instead of the current weight e.g. oedema, PDA, failure to thrive.
- Phototherapy and/or radiant warmers can increase insensible water loss. An extra 10-20 mL/kg/day to daily fluid requirements may be needed. Insensible fluid losses in extremely preterm infants can be enormous, especially under a radiant warmer> Fluids > 200 mL/kg/day may be needed. The use of a closed incubator and high humidity (> 80%) helps to reduce this issue. Monitor electrolyte and osmolality estimations (8-12 hourly) in the first few days after birth. See Blood Tests: Ordering.
- Volume calculations. The total volume required for the 24-hour period is calculated by multiplying the infant's weight by the mL/kg/day then dividing by the number of feeds per day. If on continuous intravenous therapy or continuous milk feed it is divided by 24 to give the hourly rate.

E.g. for an infant weighing = 2.135 kg with a daily volume requirement of 120 mL/kg

2.135 x 120 = 256 mL total volume required in 24 hours

- 256 mL divided by 24 (hourly rate for intravenous infusion) = 10.7 mL every hour
- 256mL divided by 12 (two hourly feeds / 12 feeds per day) = 21 mL every 2 hours
- 256mL divided by 8 (three hourly feeds / 8 feeds per day) = 32 mL every 3 hours
- 256mL divided by 6 (four hourly feeds / 6 feeds per day) = 43 mL every 4 hours

Initiation of Enteral Feeding

- **Enteral feeding** should be commenced as early as possible ideally within six hours of birth, and gradually increased as early as possible in the presence of clinical stability, according to the following Standardised Enteral Feeding Schedule below:

Standardised Enteral Feeding Schedule		
Birth Gestation	**Day 1 Of Feeding** **If EBM Or PDHM Available** **If formula, commence Term Formula when clinically indicated**	**Grading Up**
<25 wk	≤ 10 mL/kg/d)i.e. 0.5-1.0 mL/kg/d 4-6 hourly	↑ 15-20 mL/kg/d
25-26+6 wk	≤ 10 mL/kg/d (i.e. 1-2 mL/kg 4 to 6 hourly) then ≤ 20 mL/kg/d (i.e. 1-2 mL/kg 2 hourly), then progress →	↑ 20-25 mL/kg/d
27 - 31^{+6} wk	≤ 20 mL/kg/d (i.e. 1-2 mL/kg 2 hourly), then progress →	↑ 20-≤30 mL/kg/d
32 - 34^{+6} wk	60 mL/kg/day maximum if stable, then progress (initially, a proportion of total fluid given IV may be required →	↑ 30-35 mL/kg/d
≥35 wk	May commence full feeds ± breast feeding if appropriate. Term infants should be offered their first breastfeed within the first few hours after birth if no contraindications.	

1. All infants below 32 weeks gestation are to receive 0.2mL of EBM orally and documented on MR489.00A/B Fluid balance chart A/B with each feed as available (in addition to the ordered feed amount). Or PDHM (with parental consent if EBM not available or not chosen)
2. Infants on continuous milk feeds are to receive 0.2 mL of EBM orally, 2 hourly until suck feeds commence.
3. Rate of feed increments are at the discretion of the attending neonatologist

- For infants of mother's who choose not to breast feed their infant, or cannot supply enough milk for their infant, options include pasteurised donor human milk (PDHM) for infants meeting the PDHM criteria, or infant formula. Privately sourced expressed breast milk will not be accepted due to the safety risks associated with this milk.
- **Preterm infants** are to receive their own mother's breast milk preferably in the order in which it is expressed ensuring that infants receive the nutritional and immunological benefits of colostrum and early milk. Mothers often produce more milk than is required by their infants in the first few days of life. Freeze the surplus early milk and defrost to use before fresh milk expressed later. Early milk has higher protein concentration and there is weak evidence to suggest that freezing milk may reduce or eliminate CMV. Mother's own fresh milk can be used if frozen early milk is not readily available and as breastfeeds are introduced.
- **Pasteurised Donor Human Milk (PDHM)** is supplied for all neonates ≤32+6 weeks gestation and/or ≤1500grams when breast milk is not available (or mothers choose not to breastfeed). Other infants with a risk of feed intolerance will be considered for PDHM on an individual basis by Consultant/SR. PDHM is usually fed up until a corrected gestation of 34 weeks unless demand for PDHM is high. Parent consent is required for use of PDHM.
- **Early trophic feeds** maintain gut integrity[12,13] and are encouraged for all infants when EBM or PDHM is available. If unable to grade up feeds, consider gestational age-appropriate trophic feeds of **≤10 mL/kg/d**.
- **Breast milk and infant formula fortification/supplementation.** Parental consent is needed prior to giving formula milk when mother's own breastmilk is unavailable, and/or PDHM are not options. Referral to the neonatal dietitian is recommended to manage specific medical conditions.
    - Consider human milk fortifier for preterm infants (<37 wk GA) once breast milk intakes of 80 mL/kg/day are achieved.
    - Use term formula to fortify breastmilk for term infants (>37 wk GA) with growth failure.
- Refer to Nutrition Room Protocols for:
    - Fortified Expressed Breast Milk and Formula Feeds (Table 1)
    - Estimated Composition of Standardised Preterm EBM and Preterm Formula Feeds (Table 3).
- **Infant formula feeding**
    - <35 GA: Commence as per Standardised Feeding Schedule using Term Formula and progress as tolerated. Transition to Preterm Formula when tolerating full oral feeds.
    - >35 GA: Commence as per Standardised Feeding Schedule using Term Formula and progress as tolerated.

Gastric Tube Feeds

Continuous Milk Feeds (CMF)

- CMF are recommended for neonates with signs of intolerance with intermittent/bolus feeds, respiratory compromise exacerbated by bolus feeds, and/or persistent hypoglycaemia.
- Use a syringe pump and an enteral Luer lock syringe 30 mL/50 mL with a long extension (change daily), or if using a Kangaroo Pump, see Kangaroo Pump instructions.
- Decant 3 hours volume of milk, use a mixing cannula to aspirate into the syringe. Add the long extension tubing and prime line first to prevent air being pumped into the stomach. Label syringe with infant details as per labelling requirements. Attach a 'continuous milk feed' sticker and label extension line with the date/time to be changed
- Refer to Gastric Tube Feeding in the NICU for testing procedure prior to feeding.
- Calculate hourly rate, set calculated rate on pump and commence infusion. Changes and setting of rates to be double checked by nursing staff.
- Document type of milk and hourly volume delivered on the observation chart.

Rescheduling from CMF to 2 hourly feeds

- Multiple changes to feeds should not be made simultaneously. Therefore, if the feed is increasing in volume, achieve this before changing time interval.
- Document and report any large residuals or vomiting, indicating feed intolerance.
- Turn CMF off for a period of one hour before commencing the first bolus feed. E.g infant on 5mL CMF progressing to 10mL 2 hourly

Example		Start time	1hr later	1hr later	1hr later	1hr later	1hr later	1hr later	1hr later	1hr later	1hr later	1hr later	1hr later
TIME	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
5mL/hr	CMF off	5mL	5mL	4mL	6mL	3mL	7mL	2mL	8mL	1mL	9mL	0mL	10mL

Intermittent/Bolus

- Intermittent feeds have been shown to induce cyclical bursts of enteroinsular hormones. These hormones stimulate gut growth, mucosal development, increase gut motility, and influence pancreatic endocrine secretion and hepatic metabolism.
- Suitable for stable neonates that are too immature to suck feeds and/or unable to take adequate nutrition to grow. Feed 2, 3 or 4 hourly depending on diagnosis, weight, gestational age. Refer to Gastric Tube Feeding in the NICU for gastric tube testing procedure prior to feeding.

- Infants ≤35 weeks GA should be tube fed in a side-lying or prone position.
- Infants >35 weeks GA should be fed in a side-lying position unless prone positioning is indicated for medical reasons.
- Position yourself so the infant is facing towards you during the feed so you can act promptly in the event of vomiting or distress.
- Parents can hold the syringe whilst their infant is receiving a tube feed provided they wish to do so and the criteria in the Gastric Tubes: Learning Package for Parents Holding Syringe During Gastric Tube Feeding are met.

2 Hourly to 3 and/or 4 Hourly Feeds (rescheduling of feeds)

- The progression towards demand feeding is achieved by increasing the time between feeds according to the neonate's size, condition, and tolerance of feeds.
- A slow progression from 2 to 3 to 4 hourly feeds may suit neonates who have had previous attempts at rescheduling of feeds and have failed to tolerate the larger volume.

For example, rescheduling from 2 hourly feeds (20 mLs) to 3 hourly feeds (30 mLs)

• Add the 2-hour volume + 3-hour volume together • Divide combined volume by 2 • Give this volume every 2 ½ hour for the next 2 feeds and if tolerated, continue after 3 hourly with the full 3 hourly volume.	$\frac{20 + 30 = 50\text{mL}}{2}$ = 25 mL every 2 ½ hours

Start time (0800)	2½ hours later (1030)	2½ hours later (1300)	3 hours later (1600)
20 mL	25 mL	25 mL	30 mL

Withholding enteral feeds

Is necessary for any haemodynamically unstable infant with:

- **Sepsis**: In unstable patients with sepsis, consider withholding feeds until 24 - 48 hours of antibiotic therapy is completed, the blood pressure is stable without inotropes or colloidal support, and respiratory assistance is back to the baseline levels before clinical deterioration occurred.
- **NEC:** Continuation of milk feeding during the period of suspected sepsis or NEC will be at the discretion of the attending neonatologist.

  - **(> Stage II)**: Feeds are stopped for a minimum of 7 days.

- **Blood Transfusion**: In infants thought to be at high risk of NEC, consider ceasing feeds for 4 hours prior to giving a blood transfusion and then resume feeds 4 hours after blood product completion[15]. If feeds are ceased, replacement IV fluids may be required.
- **PDA**: Small feeds may be continued during Indomethacin therapy for PDA.

Bottle Feeding Infants

- From 32-34 weeks onwards, the rooting reflex is quite active and nutritive sucking begins with a stable rhythm, to progress to full suck feeds the infant has to have sufficient neurodevelopment to regulate a rhythmic suck-swallow-breathe pattern with cardiorespiratory stability.
- At 34-36 weeks most infants will have developed awake/sleep patterns and be capable of managing nutritive sucking with a coordinated pattern.
- Between 34-40 weeks healthy infants will maintain satisfactory growth with full oral feeding by demand.

Also refer to Nutrition: Bottle Feeding a Breastfeeding Infant.

Feeding Position

- Position is important and depends on the infants muscle tone. The head must be in alignment with the trunk and all limbs must be contained (wrapped) or supported.
- Preterm infants especially cannot always cope with the cradled semi-recumbent posture of the term infants and may cope better if supported in a semi-upright position. Careful attention to correct alignment is paramount.
- Some infants with CLD or other complex problems benefit from an elevated side-lying position. Oxygen dependent infants may need an increase in their O_2 requirements until they develop a coordinated rhythm.
- If the infant loses interest in sucking or uses a non-nutritive (chomping) action and is not showing signs of stress or fatigue, it may be helpful to gently support the infant's lower jaw near the base of the tongue to improve jaw stability. Excessive manipulation of the teat is likely to be distressing and over stimulating resulting in 'shut-down'.

Teat Size / Shape

A variety of teats are available in the unit to support infant feeding, including Sepel, Medela and Pigeon Teats. Try not to switch between different teats for at least 24 hours to assess progress. Start with a white sepal teat for babies <2.5 kg (see Table p9). Preterm infants initially have an uncoordinated suck-swallow-breath technique and tend to suck vigorously and not pause long enough to breathe which can result in

apnoea, desaturation, and bradycardia. Pacing the feed and tilting the bottle so no milk is in the teat or removing the teat from their mouth will allow them to recover. Involve a feeding specialist/team where needed.

Sepel Teats				
Colour	White	Blue	Blue	Green
Code	XTUF-F	XTXF-F	STXF-F	XTSF-F
Teat	Extra Small	Extra Small	Small	Extra Small
Flow	Ultra Slow	Extra Slow	Extra slow	Slow

Medela and Pigeon Teats				
	Disposable	**Disposable**	**Re-usable**	**Re-usable**
Colour	Clear	Clear	Clear	Clear
Code	Medela Blue writing	Medela Red writing	Pigeon Peristaltic Teat	Pigeon Ringed Teat
Teat	Preterm / Term	Term	Preterm / Term	Preterm / Term
Flow	Slow Slow	Medium	Extra slow	Slow
Note: Dr Brown's teats may be available through a feeding specialist.				

Signs of Stress or Fatigue

Can occur before, during or after a feed and include the following:

- Limpness.
- Gagging and/or squirming.
- Desaturation, rapid / laboured or irregular breathing and bradycardia.

If any of these signs are present, stop the feed and wait for the infant to regain their stability. Try positioning the infant upright (may be wind related). If after recommencing the feed the infant shows signs of stress again, complete the feed by the gastric tube.

Specialised Medical Nutrition Products Post-Discharge

Specialised medical nutrition products (e.g. Neocate, Pepti Junior) may be required to manage nutrition-related medical conditions of some infants. These products are expensive, unless available on the Pharmaceuticals Benefit Scheme, and subject to meeting criteria, infants may be eligible for one-month supply at discharge through pharmacy, while awaiting specialist review. See Nutrition Room Protocols

Related CAHS internal policies, procedures and guidelines

Tiny Baby Guideline <25 weeks gestation infants: IVH prevention and care in first week

Gastric Tube Feeding in the NICU (health.wa.gov.au)

Labelling of Injectable Medications and Fluids (health.wa.gov.au)

Necrotising Enterocolitis

Nutrition: Bottle Feeding a Breastfeeding Infant (health.wa.gov.au)

Parenteral Nutrition (health.wa.gov.au)

Useful resources (including related forms)
Kangaroo ePump Instructions

References and related external legislation, policies, and guidelines

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Amendment Dates:	New guideline combining the following: Enteral Feeding: Bolus Tube Feeds, Continuous Milk Feed (CMF), Bottle Feeds; Enteral Feeding: Initiation and Progression; Nutrition Volume and Nutritional Requirements April 2025 – initiation of enteral feeding within 6 hours of birth October 2025 – addition of withholding feeds for suspected NEC or sepsis at discretion of Neonatologist December 2025 – addition of tiny babies considerations	Next Review Date:	July 2027
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