Scope

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 UHL documents

<table>
<thead>
<tr>
<th>Document</th>
<th>ID Number (if applicable) or Appendix No.</th>
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</thead>
<tbody>
<tr>
<td>UHL Neonatal Parenteral Nutrition Guideline_</td>
<td>C28/2018</td>
</tr>
<tr>
<td>UHL Nutrient Enriched Preterm Formula Guideline</td>
<td>C8/2010</td>
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<tr>
<td>UHL Probiotic Guideline</td>
<td>C47/2018</td>
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<td>UHL Breastmilk fortifier Guideline</td>
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<tr>
<td>UHL Neonatal Surgical Guideline</td>
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<tr>
<td>UHL Neonatal Vitamin and Mineral Guideline</td>
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<tr>
<td>Feeding Guidelines for Children on Intensive Care Units</td>
<td>C90/2016</td>
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<tr>
<td>Joint Infant Feeding Policy</td>
<td>E1/2015</td>
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Key Points

1. Actively support breast feeding friendly measures to enable Breast milk as the feed of choice
2. 0.2 ml buccal colostrum is recommended for 48 hours after birth
3. Routine check of gastric residuals is not recommended
4. Minimal enteral nutrition is recommended within 24 hours of birth in a stable baby
5. Aim to initiate feeds as per the flowchart
6. 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
7. Weekly review of growth chart and nutritional intake to achieve and maintain expected growth (Table 1) (Table 2)
8. Dietician referral is recommended for babies with complex nutritional needs

Introduction 1-6

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.

The goals of nutritional support in preterm infants are to:

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

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.

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

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Term infant (SACN, 2010), (SACN, 2016)</th>
<th>Preterm infant 1000 g – 1800g (ESPHGAN, 2010) (Koletzko, 2014)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (Kcal/kg/day)</td>
<td>Breast fed 96</td>
<td>Formula/combo 120</td>
</tr>
<tr>
<td></td>
<td>2.1 - 2.6</td>
<td>&lt; 1 kg 4.0 – 4.5</td>
</tr>
<tr>
<td>Sodium (mmol/kg/day)</td>
<td>1.5</td>
<td>3-5</td>
</tr>
<tr>
<td>Potassium (mmol/kg/day)</td>
<td>3.4</td>
<td>2-3</td>
</tr>
<tr>
<td>Calcium (mmol/kg/day)</td>
<td>3.8</td>
<td>2.5-5.5</td>
</tr>
<tr>
<td>Phosphate (mmol/kg/day)</td>
<td>2.1</td>
<td>1.9-4.5</td>
</tr>
<tr>
<td>Folic Acid</td>
<td>50ug/day</td>
<td>35-100µg/kg/day</td>
</tr>
<tr>
<td>Vitamin D (µg/d)</td>
<td>8.5 -10</td>
<td>10-25</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>350ug RE/day</td>
<td>400-1100 µgRE/kg/d</td>
</tr>
<tr>
<td>Iron</td>
<td>1.7 mg/day</td>
<td>2-3mg/kg/d</td>
</tr>
</tbody>
</table>

**Weight Monitoring**

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

- Measure and document weight and OFC as a minimum weekly in BadgerNet as per Table 2 below.
- 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**
### Table 2 - Guide to anthropometric monitoring and expected growth in preterm and term infants

<table>
<thead>
<tr>
<th>Weight</th>
<th>Aim</th>
<th>Indicates</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30 weeks post conceptual age</td>
<td>30-36 weeks</td>
<td>Fluid balance changes</td>
<td>On admission and a minimum of 2 times per week</td>
</tr>
<tr>
<td>&lt;30 weeks post conceptual age</td>
<td>&gt;36 weeks post</td>
<td>Changes in adipose tissue and lean body mass.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>conceptual age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18g/kg/day</td>
<td>15g/kg/day</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30g/day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>Velocity = 1.4cm</td>
<td>Skeletal growth and organ growth</td>
<td>As required, for babies with weight</td>
</tr>
<tr>
<td></td>
<td>per week</td>
<td></td>
<td>concerns to optimise nutritional</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>management</td>
</tr>
<tr>
<td>Head circumference</td>
<td>Velocity = 0.9cm</td>
<td>Brain growth and brain pathology</td>
<td>On admission and Weekly</td>
</tr>
<tr>
<td></td>
<td>per week.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Needs assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>in conjunction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>with appropriate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>head scans)</td>
<td></td>
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</tbody>
</table>

**Actively support Breast feeding friendly measures**

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 breastmilk is not available by 24 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.

**Breast milk Fortification**

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.

In where there are growth concerns, the first step is to increase the breast milk feed volume up to 200 ml/kg/day if the baby tolerates this.
If the baby is unable to tolerate the high volumes or there is continuing poor growth, breast milk fortifier may be added.

If a baby has poor growth, in the first instance increase feed volume to 200 ml/kg/day EBM if tolerated

Add BMF if infant does not tolerate 200 ml/kg/day and growth remains suboptimal. Consider reducing fluids to 150-175ml/kg/day to ensure tolerance

BMF should not be added to formula

**Buccal Colostrum**

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.

The intended benefits of supporting early buccal colostrum 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 advice guide (Appendix 1)

**Give 0.2ml buccal colostrum 2 hourly until maternal supply adequate for more substantial enteral feeding (minimal enteral feed, and thereafter incremental feeds as required)**

Advise and encourage mother, father or appropriate support individual for mother, to give buccal colostrum by providing information leaflet and video resource
Minimal enteral nutrition (MEN) and advancement 24-26

MEN is defined as the practice of providing small amounts of preferably breast milk i.e. 0.5 ml 2 hourly 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.

**Clinically stable is defined as:**

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

Refer to Flowchart 1 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
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 48 hours 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 guideline

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

Babies weighing <1.0kg initiate feeds by **0.5ml** 2 hourly for **48** hours

Babies weighing >1.0kg initiate feeds by **1.0ml** 2 hourly for **24** hours

Once MEN tolerated for over 24 hours, start probiotics (Refer to UHL probiotics guidelines)

**Step 2b**
After 48 hours - commence feeds

To increase feeds by 30ml/kg every 24 hours until full feeds reached (Appendix 2a)

If feeds are persistently not tolerated at 30ml/kg advances, please consider reducing the volume of increase to 18 ml/kg every 24 hours. (Appendix 2b)

**Step 3**
Advance feeds as tolerated

Continue increasing at this rate until **maximum** enteral volume achieved

**Expressed breast milk up to 200 ml/kg/day if tolerated**

**Preterm formula 160 ml/kg/day for Infants**

**Mixed feeding 180 ml/kg/day**
Titration of Enteral and Parenteral Nutrition

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 20ml/kg/day enteral nutrition (EN) is achieved.**

**When to start PN weaning:** Start weaning at 60ml/kg/day - wean according to rate of increase of EN

**When to stop PN:** Stop PN once 140ml/kg/day EN achieved unless there are concerns of nutritional depletion or suboptimal growth.

Feed intolerance and management of gastric residual volumes

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.

- **Does the baby have any of the following?**
  - Vomiting, abnormal abdominal findings i.e. tender abdomen, abdominal tenderness, blood-stained stools

- **Assess:** Temperature gap, HR, RR, BP, SpO₂, BE, lactates
  - **Is the baby clinically stable?**
    - **Yes**
      - **Assess GR**
        - **Light bile stained**
          - **Continue feeds as planned**
          - **Check NG/OGT tip position (dark green)**
          - **Clinical examination**
          - **Consider X-ray abdomen for intestinal obstruction/ileus/NEC**
          - **Feeding plan guided by assessment and investigations**
        - **Dark bile stained**
          - **Withhold feeds**
          - **Replace up to 50% of feed volume and hold current feed**
          - **Recheck gastric aspirate before next feed**
          - **Gastric aspirate > 50% of previous feed volume**
          - **Consider slow bolus feeds or going back to last tolerated feed volume or no further increments for 24 hours**
    - **No**
      - **Stop feeds**
        - **Further management guided by assessment and investigations**

- **Milk aspirates of more than or equal to ≥ 5ml/kg and > 50% of pre feed volume**

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Referral criteria to nutrition specialists

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

Nutrition Round
Nutrition rounds conducted weekly involve discussions of each baby’s current growth and nutritional status. It is also an opportunity to identify babies to discuss the following day on gastro round.

MDT consisting of neonatal on-service consultant, neonatal dietitian and neonatal pharmacist (pharmacist on round at LRI ITU & HDU only).

Gastro Round
Gastro round is conducted weekly at LRI NNU. 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.
Appendices

Appendix 1 – Buccal Colostrum Guide

General Guidance

- All mothers anticipating delivery of a preterm infant less than 34 weeks gestation should be informed about buccal colostrum (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 2 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 2 – Milk feed increase charts

2a: Milk Feed Increase Chart at 30 ml/kg/day increment on 2 HOURLY feed

<table>
<thead>
<tr>
<th>Working weight between (g)</th>
<th>increase two-hourly milk feed volume by</th>
</tr>
</thead>
<tbody>
<tr>
<td>350 &amp; 650</td>
<td>0.5 ml every 12 hours</td>
</tr>
<tr>
<td>651 &amp; 1000</td>
<td>1 ml every 12 hours</td>
</tr>
<tr>
<td>1001 &amp; 1500</td>
<td>1.5 ml every 12 hours</td>
</tr>
<tr>
<td><strong>1501 &amp; 3000</strong></td>
<td>2 ml every 10 hours</td>
</tr>
</tbody>
</table>

** This can be used for babies with high risk under clinical discretion

2b: Milk feed increase at 18 ml/kg/day increment on 2 HOURLY feeds

<table>
<thead>
<tr>
<th>Working weight between (g)</th>
<th>increase two-hourly milk feed volume by</th>
</tr>
</thead>
<tbody>
<tr>
<td>350 &amp; 700</td>
<td>0.5 ml every 18 hours</td>
</tr>
<tr>
<td>701 &amp; 1050</td>
<td>1 ml every 18 hours</td>
</tr>
<tr>
<td>1051 &amp; 1750</td>
<td>1 ml every 12 hours</td>
</tr>
<tr>
<td>1751 &amp; 3000</td>
<td>1 ml every 10 hours</td>
</tr>
</tbody>
</table>
References


20. Ma A et al. Oropharyngeal 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


Audit Standards

1. All eligible babies (i.e. preterm, sick term) who cannot be put to the breast, but are able to receive orogastric feeds, should in the first day of life, receive 0.2 ml buccal colostrum. This should ideally be given within 2 hours of birth.
2. Stable preterm infants < 1000gm should receive MEN within 6 hours of birth.
3. Weekly review of growth chart and nutritional intake.

Guideline development:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>January 2021</td>
<td>Guideline Meeting</td>
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<tr>
<td>February 2021</td>
<td>Ratified in Neonatal Governance Meeting</td>
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