LOCAL OPERATING PROCEDURE

NEONATAL SERVICES DIVISION

Approved by Quality & Patient Safety Committee
May 2019

ENTERAL NUTRITION - PRETERM INFANTS 1000G AND UNDER

This Local Operating Procedure is developed to guide safe clinical practice in Newborn Care Centre (NCC) at The Royal Hospital for Women. Individual patient circumstances may mean that practice diverges from this Local Operating Procedure.

1. AIM

- To provide feeding guidelines for preterm infants with birth weight ≤1000g

2. PATIENT

- Preterm neonates ≤1000 g birth weight

3. STAFF

- Medical and nursing staff

4. NUTRITION GOAL

- Primary goal: To obtain functional outcomes[1] similar to that of term infants.[2]
- Interim goal: To achieve physical growth targets so as not to lose more than 1 standard deviation in weight and head circumference to discharge.[3]

KEY PRACTICE POINTS:

- Antenatal counselling should include education of women about the importance of expression of breast milk within 1 hour after birth.
- Medical officer or CMC for lactation newborn care to provide information and obtain written informed consent for pasteurised donor human milk (PDHM) and probiotic prior to the delivery to avoid undue delay in the commencement after delivery.
- Commence minimal enteral nutrition (trophic feeding) at 1 mL 2nd hourly soon after birth (average trophic feed volume is 10-20 mL/kg/day). Medical officer to prescribe milk on fluid chart along with Day 0 fluid prescriptions. Milk is given as extra on day 0 of life and can be included when feeds are tolerated.
- Commence fortification as follows: Commence half fortification at 120 mL/kg/day of enteral feeds and full fortification at 150 mL/kg/day of enteral feeds.
- Cease intravenous lipid emulsion once the infant tolerates 100 mL/kg/day of enteral feed.
- Cease aminoacid/dextrose infusion and remove central line once the infant tolerates 120 mL/kg/day of enteral feeds.
- Check gastric pH every feed for tube position. DO NOT routinely aspirate the full gastric contents.
- Assess the feed tolerance by monitoring for any abdominal distension and vomiting.

5. CLINICAL PRACTICE

Prior to birth

- NICU medical team or CMC for lactation newborn care to provide counselling for the woman and her partner about the importance of expression of mother's own milk (MOM), breastfeeding, feeding goals and the availability of pasteurised donor human milk (PDHM). But DO NOT encourage expression prior to delivery, which may facilitate preterm labour.

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At birth

- Use the following table to determine if the infant is appropriately grown for gestational age (AGA) or growth restricted (Small for Gestational Age (SGA), birthweight < 10th percentile):

Fenton Growth Charts - 10th percentile[4]		
	Male	Female
GA	Weight at 10th percentile, g	Weight at 10th percentile, g
23	460	440
24	510	480
25	570	530
26	620	580
27	690	640
28	770	700
29	860	790
30	980	900
31	1130	1030

- Commence trophic gavage feeding 1 mL mother's own milk (MOM) or PDHM 2 hourly and continue for 48 hours as tolerated.
- Commence probiotic as per the protocol.

After 48 hours of life

- Increase feeds by 1 mL every 12 hours* until 170 mL/kg/day is reached. Average targeted increase is 20 mL/kg/day.
- Once 3 mL per feed is reached, administer feeds as a slow bolus over 20 minutes.

*SGA infants: May need to advance the feeds slower.

Fortification

- Commence 22-23 kcal/30 mL (half fortification) at 120 mL/kg/day and full fortification at 150 mL/kg/day.*
- Fortifier can be either cow's milk derived or human milk derived (Prolacta). If Prolacta is used, refer to Prolacta protocol.
- Continue fortification generally until the time of discharge and or until transitioning to breast feeds.

*SGA infants: Fortification may be commenced at 150-170 mL/kg/day.

Cessation of Parenteral Nutrition (PN)

- Cease intravenous lipid emulsion once the infant tolerates 100 mL/kg/day of enteral feed.
- Cease aminoacid/dextrose infusion and remove central line once the infant tolerates 120 mL/kg/day of enteral feeds.

Monitoring for feed intolerance

- Regular clinical assessment is of paramount importance and any change in abdominal findings (distension, discolouration of abdominal skin, blood in stool) need immediate review including cessation of feeding and investigations to rule out abdominal pathology.

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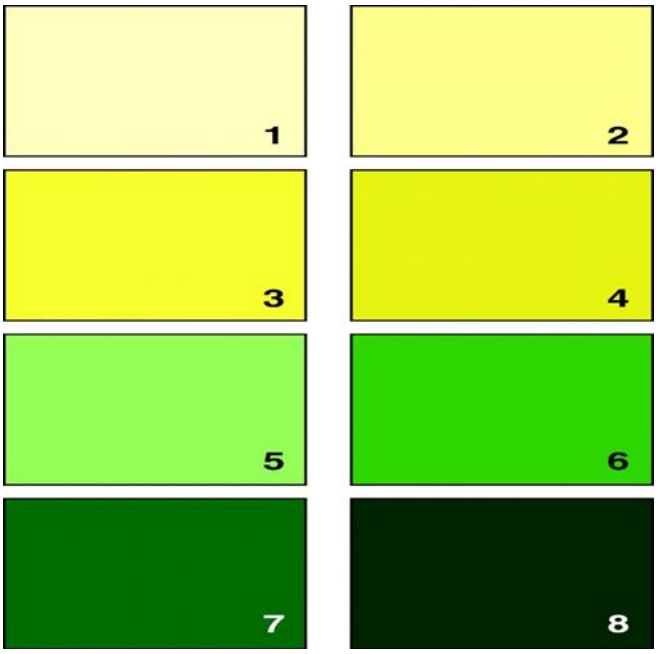
- Check gastric aspirates prior to feed to assess the colour and pH but not aspirate the whole gastric fluid:



- If aspirate/vomit is heavily bile stained (Avocado or spinach colour, figure 7 or 8 in the picture above) – return aspirate, stop feeds and notify medical team for assessment.
- Occasionally, the medical team may decide to measure the aspirate volume as a marker of feed intolerance:
    - If aspirate volume <50% of previous 6 hour volume and not heavily bile stained and clinically stable abdomen – return aspirate and continue to feed.
    - If aspirate volume ≥50% of previous 6 hour volume or heavily bile stained– return aspirate, stop feed and assess the infant for any abdominal pathologies.

Beneprotein

- Once on 150-170 mL/kg/day of enteral feed, monitor adequacy of nutrition weekly by (a) measuring weight, length and head circumference, (b) analysing human milk for its energy, fat, carbohydrate and protein content using Miris Human Milk analyser and (c) blood urea (weekly or fortnightly).
- If blood urea is <3.2 mmol/L, commence beneprotein at 0.5 g/kg/day. This is added to either unfortified or fortified milk. Refer to beneprotein formulary in the medications section.
- Repeat blood urea measurement once or twice a week and adjust beneprotein dose as per table below:

Blood Urea	Beneprotein
<3.2 mmol/L	Increase by 0.5 g/kg/day
3.2 – 5 mmol/L	Continue same
5 – 7.1 mmol/L	Reduce by 0.5 g/kg/day
>7.1 mmol/L	Stop supplement and repeat blood urea a week later

Milk content analysis

- NICU team to measure the concentration of fat, protein, carbohydrate, total solids, and energy in milk using MIRIS Human Milk Analyser every Wednesday morning prior to morning ward rounds.
- Discuss with neonatologist before adjusting the fortifier or adding individual nutrients.

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Nutrition intake entry

- Nurse to enter daily nutrient intakes (including IV fluids, enteral feeds, pentavite, Iron and any other nutrients) in NICUS Nutrition section.

Anthropometric measurements

- Measure weight Mon/Wed/Friday.
- Measure length and head circumference every Wednesday.
- Plot all the measurements on NICUS growth charts.
- Reasonable growth targets after initial weight loss and regain in birthweight can be drawn as follows:[5-7]
    - Weight – 15 to 20 g/kg per day
    - Length – 1 cm/week
    - Head circumference – 0.7 cm/week

Grading up feed intervals

- Consider changing over to 3rd hourly feeds once the infant is tolerating 2nd hourly feeds and weighing over 1500 g.

Precautions

- Haemodynamically significant PDA.
- Infants on inotropic support and/or muscle relaxants.
- Infants on indomethacin or ibuprofen.
- Small for gestational age (SGA) infants.
- Necrotising enterocolitis and other medical or surgical gastrointestinal conditions.

Special considerations

- Feeding regime may be altered (eg. hourly feeds, continuous feeds, transpyloric feeds or nasojejunal feeds) in special situations such as birthweight <750g, growth restriction, abnormal umbilical dopplers, feed intolerance, post necrotising enterocolitis.

6. DOCUMENTATION

- eMR
- Neonatal Observation Chart
- NICUS database
- Medication chart

7. EDUCATIONAL NOTES

- These guidelines are a compilation of an integrated system for providing optimal newborn care, family integrated care, kangaroo care (skin-to-skin contact), rooming-in, respecting the WHO/UNICEF Ten Steps to Successful Breast-feeding expanded in 2011 for use in NICUs, and other best practices for neonatal care.[8]
- This feeding strategy aims to promote and support breastfeeding in the NICU.
- Early intervention with milk expression soon after delivery (ideally within 1 hour of birth) is critical for milk production of NICU mothers; therefore, mothers should be taught a method of milk expression within this time frame.
- This feeding strategy should be done in conjunction with Immuno-Supportive Oral Care (ISOC).[9]
- European Society of Pediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) 2015 recommendations[3]:
    - Goals of nutrition: The achievement of adequate growth in preterm infants is extremely relevant in terms of long-term development. Reduction of the incidence and severity of extrauterine growth restriction represents one of the main goals in premature infant nutrition and efforts must begin immediately after birth. The aim of postnatal growth is not to lose more than 1 SDS in weight and head circumference from birth to discharge. Growth is not only weight gain. It includes also head circumference and length gains. (ESPGHAN 2015)

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  - Human milk (HM) is the best. Feeding of HM protects against NEC in dose-dependent fashion.
  - HM strongly protects premature babies against late-onset sepsis in dose-dependent fashion.
  - HM has trophic effects on the gastrointestinal tract. The trophic effects of HM are attributable to multiple components that are known to stimulate maturation of the immature gut. Clinically trophic effects are manifested as lower gastric residual volumes, more rapid advancement of feedings and earlier achievement of full feedings.
  - Fortification: All preterm infants with a birth weight <1800 grams should be fed fortified HM. HM should be fortified with protein, vitamins and minerals. HM fortification should start with standard fortification. If infants do not grow appropriately, individualized fortification is advisable.
  - There are two types of individualized fortification: targeted fortification (based on milk analysis) and adjustable fortification (based on blood urea nitrogen (BUN) measurements). Both are advisable depending on the NICU experience and facilities. In our NICU, we implemented adjustable fortification.
  - Pasteurised Donor Human Milk (PDHM): Mother's Own Milk (MOM) is the first choice in preterm infant feeding, and strong efforts should be made to promote lactation. When mother's milk is not available, PDHM obtained from a well-established human milk bank is the preferred choice.
  - Fresh MOM is the first choice for feeding preterm infants.
- Human milk derived HMF: Prolacta (manufactured by Prolacta Bioscience Inc, 757 Baldwin Park Blvd, City of Industry, CA 91746, USA) is a human milk derived fortifier, processed from donor human milk. Each bottle contains 20-30 mL fortifier and each bottle is derived from qualified pooled donor milk. This is a registered product in USA. Testing, screening and production process is detailed in the enclosed document, but in brief every donor undergoes medical review and screening for HIV-1 & 2, HTLV I & II, HBV, HCV, and syphilis. DNA sample is collected from each donor to create fingerprint of donor so milk can be verified. Raw milk is tested for DNA matching for assured donor identification, B. cereus screening, adulteration and drugs of abuse testing. Viral PCR screening for the presence of HIV-1, HBV and HCV and microbiological testing is performed on the milk during processing and pasteurisation. Final product is again tested for Aerobic count, B. cereus, E. coli, Salmonella, Pseudomonas, coliforms, S. aureus, yeast and moud. A full nutritional analysis is also performed on the final product. All Prolacta products are shipped frozen in an insulated cooler with dry ice. Frozen Prolacta products have a shelf life of 2 years.[10]
- Prolacta has been available in the USA for 12+ years. In extremely low birthweight infants, use of an exclusively human milk diet (i.e. mother's milk or donor human milk plus a human milk-derived fortifier) resulted in: (1) decreased length of hospital stay, (2) reduction of parenteral nutrition days, (3) reduced days of feeding intolerance and number of days to full feeds, (4) improved weight and length velocity, (5) lower mortality, (6) reduced incidence of late onset sepsis, (7) reduced incidence of retinopathy of prematurity and chronic lung disease and (8) significant reductions in the incidence of necrotizing enterocolitis (NEC). A study conducted in preterm infants ≤28 weeks or ≤1250 g evaluated the clinical benefits and costs of an exclusive human milk diet (i.e. human milk plus Prolacta) versus a combination of mother's milk fortified with cow milk-based fortifier and formula, or a diet of formula only. In those babies fed an exclusive human milk diet, there was a minimum of 4.5 fewer additional days of hospitalization, 9 fewer days on parenteral nutrition, and a reduction in NEC. This resulted in cost savings of up to US$15,750 per infant.[11-20]
- Beneprotein is 100% whey protein isolate. It's PDCAAS (Protein Digestibility Corrected Amino Acid Score): 100. Osmolality is 44 mOsm/kg water.

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- Adjustable fortification regimen based on BUN levels in our guidelines is a modification of adjustable protein fortification regimens suggested by 2 previous trials.[21-22]
- Definition of Functional Outcome: The level of ability to perform age-appropriate activities of daily living and socially allocated roles.[1]
- The Miris HMA™ quantitatively measures the concentration of fat, protein, carbohydrate, total solids, and energy in human milk.[23]

8. RELATED POLICIES/PROCEDURES/CLINICAL PRACTICE LOP

- Pasteurised Donor Human Milk (PDHM) for vulnerable infants - Refer to DOH PD2018_043
- Fortifiers & Formula Preparations
- Breastfeeding - First Expression - refer LOPs Refer to LOPs Lactation/Infant Feeding topic
- Enteral Feed Warming – Calesca
- Immuno-Supportive Oral Care (ISOC)

9. RISK RATING

- Low

10. NATIONAL STANDARD

- Clinical Governance
- Partnering with Consumers
- Comprehensive Care

11. ABBREVIATIONS AND DEFINITIONS OF TERMS

NCC	Newborn Care Centre	PDA	Patent Ductus Arteriosus
CMC	Clinical Midwifery Consultant	NICU	Neonatal Intensive Care Unit
PDHM	Pasteurised Donor Human Milk	ISOC	Immuno-Supportive Oral Care
MOM	Mother's Own Milk	HM	Human Milk
AGA	Appropriate for Gestational Age	NEC	Necrotising Enterocolitis
SGA	Small for Gestational Age	BUN	Blood Urea Nitrogen
GA	Gestational Age	HMF	Human Milk Fortifier
PN	Parenteral Nutrition		

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13. AUTHOR

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REVISION & APPROVAL HISTORY
April 2019 Major Revision Approved NCC LOPs Committee
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