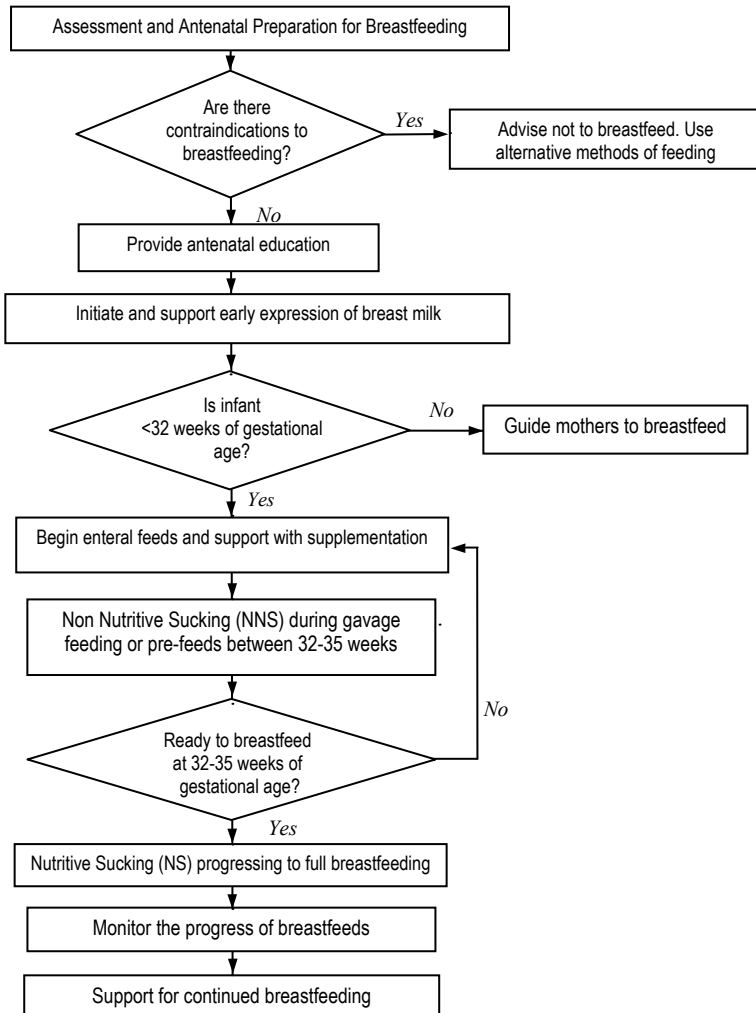


MANAGEMENT OF BREASTFEEDING FOR PRE-TERM INFANTS

Scope of the guidelines

These clinical guidelines are tools to assist healthcare professionals who are involved in the management of breastfeeding mothers and their pre-term infants. They should be adapted to suit a particular situation and patient.

Algorithm for the management of breastfeeding



Summary of recommendations

A. ASSESSMENT AND ANTENATAL PREPARATION

Contraindications to Breastfeeding

D/4 Identify maternal and infant contraindications to breastfeeding so as to appropriately advise mother in relation to the following conditions:

Maternal:

- HIV and certain infectious diseases (eg. untreated tuberculosis);
- substance abuse;
- certain medications (eg. chemotherapy drugs);

Infant:

- galactosaemia;
- phenylketonuria.

Antenatal Breastfeeding Education

D/3 Provide parents with complete, current information on the benefits, techniques of breastfeeding and prevention of breastfeeding problems through breastfeeding booklets and individual counselling

D/4 Provide anticipatory guidance and education to parents and family members of pre-term infants on:

- initiation and early expression of breastmilk;
- realistic expectations of breastfeeding pre-term infants;
- lactation consultants services, breastfeeding support groups, breast pump rental and sales outlets;
- options for feeding to facilitate parents to make an informed choice.

D/4 Educational materials should be free of commercial advertisements related to breast milk substitutes in accordance with SIFECs (Sale of Infant Formula Ethics Committee, Singapore) Code.

Breast Care

D/4 Wash areola and nipple with water. Avoid using soap and alcohol.

D/4 Avoid antenatal expression of colostrum, nipple rolling or application of breast cream.

B. INITIATION AND SUPPORT OF EARLY EXPRESSION OF BREASTMILK

Expression of Breastmilk

D/4 Assist and encourage mothers of pre-term infants to express breastmilk early within 6 hours of delivery if medically fit.

D/4 Teach mother expression, collection and storage of breastmilk.

- D/4** Provide mothers with information regarding the importance of high quality electric breast pumps for long term milk expression

Preparation for Expression

- D/4** Instruct mother to wash her hands with soap and water before handling the equipment and expressing. Instruct mother to maintain daily personal hygiene.
- D/4** Massage the entire breast gently, both top and underside, starting from the top and stroking towards the nipple. Do this several times so that the whole breast is massaged
- D/4** Wash and sterilise all equipment such as pump attachments (plastic breast shield, valve and membrane) and collecting bottles before expressing.

Methods of Expressing Breastmilk

- D/4** Express milk preferably using a high quality pump with double pumping kit. Teach and show the mother how to pump both her breasts simultaneously.

- D/4** Collect colostrum using hand expression.

- D/4** Follow the steps for the different methods of expressing milk:

Hand expressing

- Place the thumb and finger diagonally opposite on the edge of the areola.
- Gently press inward towards the centre of the breast and squeeze the finger and thumb together.
- Repeat with a rhythmic movement.
- Move fingers around areola and express to empty all sectors of the breast.

Electric pump expressing

- Place the breast cup on the areola, centering the nipple.
- Start the suction strength on low, gradually increase the suction strength as long as there is no discomfort.

- D/4** Express for 15 minutes for simultaneous double pumping. Express 30 minutes for single pumping and hand expressing, alternating between breasts every five minutes.

- D/4** Express 6-8 times in 24 hours including once or twice at night.

Storage and Thawing of Breastmilk

- D/4** Instruct mothers to store milk in sterile, hard plastic or glass bottles and in quantities approximately equivalent to the amount the infant requires for each feed. Label bottles of expressed milk with name, date and time of expression.

- D/4** Use freshly expressed breastmilk as soon as possible within 1 hour of expression otherwise it should be refrigerated immediately.

- D/4** Use all colostrum first, followed by fresh breastmilk if possible.

- D/4** Transport breastmilk in an insulated container with ice packs.

D/4 Store breastmilk following the recommended guidelines:

<u>Location and temperature</u>	<u>Time</u>
Milk stored at 25°C	4 hr
Milk in a cooler with ice pack (15°C)	24 hr
Fresh milk in refrigerator (4°C)	48 hr
Previously thawed milk in refrigerator (4°C)	24 hr
Frozen milk:	
- Freezer with separate door from refrigerator	3 - 6 months
- Deep freezer (-20°C)	6 -12 months

D/4 Thaw breastmilk in the refrigerator or by placing it in warm water. Do not thaw or warm breastmilk in the microwave oven.

D/4 Give warmed milk straight away and discard any left over. Do not re-freeze or re-warm breastmilk.

Prevention and Management of Low Milk Volume

D/4 Review mother's pumping technique, schedule and type of pump used.

D/4 Discuss the need for adequate fluid intake, rest and relaxation techniques with mother.

D/4 Provide counselling and emotional support to mother if required.

D/4 Determine other possible causes that could affect low milk volume.

D/4 Use pharmacological enhancement of prolactin secretion.

D/4 Prescribe tab Metoclopramide 10mg three times a day (tds) over 1-2 weeks.

A/1* Prescribe tab Domperidone 10 mg three times a day for seven days.

D/4 Recommend Fenugreek, two capsules three times a day.

C. BREASTFEEDING PROGRESSION

Enteral Feeding and Supplementation

D/4 Provide intermittent or continuous enteral feeds with indwelling naso-gastric (NG) / Oro-gastric (OG) tubes.

A/1* Provide supplementation of protein, fat, calcium and phosphate, and carbohydrate to meet the nutritional requirements of the pre-term infant

A/1* Provide infant with supplementation of human milk fortifier (HMF) or formula milk as prescribed.

D/4 Add fortifier immediately before feeding followed by thorough mixing when the infant is prescribed HMF.

Assessment: Determining Readiness to Breastfeed

- D/4** Assess readiness for breastfeeding based on the following parameters: gestational age, physiological status, sleep/ wake states, sucking patterns, and behavioural cues.
- D/4** At 32 to 35 weeks gestational age, breastfeeding can be initiated.
- D/4** Assess the physiological status of the infant prior to, during and following each feed (able to regulate colour, heart rate and respiration).
- D/4** Observe for instability of the autonomic system (tachypnoea, pallor, mottling, apnoea, bradycardia, oxygen desaturation).
- D/4** Assess the infant's behaviour and hunger state that indicate readiness to feed. A feed should be offered when an infant comes to an awake and quiet state (eyes open, without movement and fussing).
- D/4** Assess infant's sucking patterns on a pacifier, finger and/or at the breast.
- D/4** Assess infant's stable motor cues (good posture and motor tone, synchronous smooth movements, grasping, hand to mouth activity, suck searching and hand holding).
- D/4** Observe for instability of the motor system (generalised hypotonia, hyperextension of extremities, finger splay and facial grimace).

Non Nutritive Sucking (NNS)

- A/1⁺⁺** Provide the pre-term infant (recommended gestation 32 to 35 weeks) with opportunities for NNS (e.g. have infant suck on emptied breast or pacifier during gavage feeding or pre-feeds).

Kangaroo Mother Care (KMC)

- D/4** Assess infant's physiological stability and medical condition prior to KMC (skin-to-skin cuddling).
- D/4** Assist mother to hold infant with diaper only, skin to skin, upright on the mother's chest.
- D/4** Refer to WHO guidelines on KMC (refer to Appendix 3 of full document)

Nutritive Sucking (NS) Progressing to Full Breastfeeding

- D/4** Initiate breastfeeding when an infant reaches 32 to 35 weeks' corrected gestational age, is eager to suck, has sustained alertness and is physiologically stable.
- D/4** Allow gradual progression of breastfeeding in the following sequence:
 - NS time < 5 mins followed by supplementation with total volume of enteral feed
 - NS time 5 to 10 minutes followed by supplementation with three quarter volume of enteral feed
 - NS time 10 to 15 minutes followed by supplementation with half volume of enteral feed
 - NS time 15 to 20 minutes with no supplement required
 - Subsequent feeding times may be early, based on infant's cues

- D/4** Assess infant behaviour during feeding. Stop breastfeeding if infant manifests stress behaviours.
- D/4** Provide gavage feeding with expressed breastmilk (EBM), EBM fortified with HMF, pre-term formula or formula milk as prescribed.
- D/4** Feed with cup or bottle when mother is unavailable and infant is on oral feeds.

D. MONITORING THE PROGRESS OF BREASTFEEDING

Observation of Breastfeeding

- D/4** Observe the following during breastfeeding sessions:
 - Correct positioning of infant at the breast
 - Ability of infant to maintain physiologic stability during feeds
 - Ability of infant to nuzzle or lick the breast during the early feed.
- D/4** Observe the following indicators for adequate intake/satiation cues:
 - Mother's breasts should feel softer after the infant has breastfed
 - Active NS for 15 mins or more with frequent audible swallowing
 - Adequate output (more than 6 wet diapers/day)
 - Daily weight gain (more than 15g/kg/day)
 - Test weighing.

Techniques on Breastfeeding

- D/4** Create a suitable environment that facilitates breastfeeding as the pre-term infant is particularly sensitive to his/her surroundings:
 - Provide a comfortable upright chair and footstool for mother.
 - Provide pillows to position infant at breast level and for mother's comfort.
 - Create a quiet relaxing space.
 - For the infant who is able to regulate his/her temperature, assist mother to undress and unwrap the infant to encourage a wakeful state.
- D/4** Show and teach mother how to adopt a comfortable position and ensure that infant is positioned correctly. The infant is held at the level of the breast and body facing the breast with head and body aligned.
- D/4** Show and teach mother to position infant at the breast using the modified cradle or football hold, or with dancer hand hold.
- D/4** Guide mother to ensure effective latching is achieved.

Frequency and Duration of Breastfeeding

- D/4** Nurse pre-term infant on demand and/or every 2-3 hourly whenever infant shows signs of hunger, such as waking from sleep, hand to mouth, rooting, sucking or crying.
- D/4** Allow pre-term infant to nurse for 15 minutes, or until infant detach from the breast or fall asleep.

E. SUPPORT FOR CONTINUED BREASTFEEDING

Discharge Planning and Support for Continued Breastfeeding

- D/4** Plan for discharge when infant is:
- medically fit;
 - physiologically stable;
 - able to maintain normal temperature in an open environment;
 - on full oral feeds and achieves a weight gain of 20 to 30 gm/kg/day
 - approximately 2 kg in weight;
 - at least 35 weeks (corrected gestational age); and
 - comfortably and competently cared for and fed by parents.
 - no recent major changes in medications or oxygen administration have occurred.
- D/4** Develop an individualised, multidisciplinary discharge plan with parents, lactation consultant, dietician and physician.
- D/4** Arrange for equipment such as an electric breast pump kit, and milk storage bottles if necessary.
- D/4** Provide follow up and support for continued breastfeeding during the infant's post discharge medical visits.
- D/4** Conduct a telephone follow-up after discharge until the infant is fully breast-feeding, if necessary.
- D/4** Support continued breastfeeding during any re-hospitalisation of mother or infant.
- D/4** Provide a list of available support resources:
- helplines;
 - lactation consultants;
 - breastfeeding support groups;
 - parents support groups; and
 - breast pump rental and sales outlets
- D/4** Refer to a lactation consultant for common problems that may interfere with continued breastfeeding.



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Levels of Evidence and Grades of Recommendation

Level	Type of Evidence
1 ⁺⁺	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias.
1 ⁺	Well conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias.
1 ⁻	Meta-analyses, systematic reviews, or RCTs with a high risk of bias.
2 ⁺⁺	High quality systematic reviews of case-control or cohort studies. High quality case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal.
2 ⁺	Well conducted case-control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal.
2 ⁻	Case-control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal.
3	Non-analytic studies e.g. case reports, case series.
4	Expert opinion.

Grade	Recommendation
A	At least one meta-analysis, systematic review, or RCT rated as 1 ⁺⁺ , and directly applicable to the target population; or A body of evidence, consisting principally of studies rated as 1 ⁺ , directly applicable to the target population, and demonstrating overall consistency of results.
B	A body of evidence, including studies rated as 2 ⁺⁺ , directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1 ⁺⁺ or 1 ⁺ .
C	A body of evidence including studies rated as 2 ⁺ , directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2 ⁺⁺ .
D	Evidence level 3 or 4 ; or Extrapolated evidence from studies rated as 2 ⁺ .

Key references

British Columbia Reproductive Care Program (2001) Nutrition Part II – Breastfeeding the Healthy Preterm Infant ≤ 37 weeks

Ministry of Health (MOH) Clinical Practice Guidelines Workgroup (2002) Management of Breastfeeding for Healthy Full -Term Infants. *MOH Nursing Clinical Practice Guidelines 2/2002* Singapore: MOH

National Health and Medical Research Council (1998) Infant Feeding Guidelines for Health Workers. NHMRC: Australia

World Health Organisation (2003) Kangaroo Mother Care – A Practical Guide. Available at <http://www.who.int/reproductive-health> Last accessed on 15/05/05

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Singapore Ministry of Health Nursing Clinical Practice Guidelines Workgroup on Management of Breastfeeding for Pre-term Infants.

Management of Breastfeeding For Pre-Term Infants



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RESEARCH UNIT

December 2006

Management of Breastfeeding for Pre-term Infants

December 2006

STATEMENT OF INTENT

This set of guidelines serves as a guide for practitioners who are involved in caring for breastfeeding mothers and their pre-term infants.

The recommendations are based on the best available evidence and existing evidence-based guidelines. New research studies are ongoing, thus the contents are subject to updates as scientific knowledge unfolds.

Every practitioner must exercise clinical judgement in the nursing management of mothers who breastfeed their infants. It is recommended that every practitioner utilises the suggested guidelines with regards to the individual mother's and her infant's condition, overall treatment goal, resource availability, institutional policies and treatment options available.

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FOREWORD

Breast milk is universally accepted as the best food for infants, with significant benefits to pre-term and immuno-compromised infants. Its wide array of bio-active components enhances host defense mechanisms, digestive functions and growth factors influencing developmental outcomes. Pre-term infants also have greater nutritional needs compared to full-term infants as many nutrients are acquired trans-placentally during the last trimester. Meeting the nutritional needs of pre-term infants is thus essential for their survival, growth and development.

To promote and support the efforts on breastfeeding for pre-term infants, we are pleased to present the guidelines on 'Management of Breastfeeding for Pre-term Infants' to all healthcare professionals involved in the care of breastfeeding mothers and their pre-term infants.

These guidelines have been designed to allow clinicians, especially those working with sick pre-term infants to provide mothers with complete and current information on the benefits of breastfeeding; promote initiation and support of early expression of breast milk; manage and support enteral feeding with supplementation; prevent and manage breastfeeding problems as well as provide continual support for breastfeeding after discharge from hospital.

This set of clinical practice guidelines will enable healthcare professionals in Singapore to adopt them into their practice where appropriate, to achieve optimal growth and development for pre-term infants.

ANG BENG CHOO
CHIEF NURSING OFFICER

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Extensive research in recent years document diverse and compelling advantages of breastfeeding and the use of human milk for infant feeding in infants, mothers, families, and society. These include health, nutritional, immunologic, developmental, psychological, social, economic, and environmental benefits (AAP workgroup on Breastfeeding, 1997).

Pre-term infants have greater nutritional needs compared to term infants because many nutrients (fat, vitamins, minerals and trace elements) are acquired transplacentally during the last trimester. They also need to attain “catch-up” growth. Human milk, being nature’s gift, is ideal for the full-term infant. It is however not quite adequate for the pre-term infant if not fortified (Ng *et al*, 1999). Supplementation of expressed breastmilk (EBM) with fortifier is required for the pre-term infant when necessary (AAP workgroup on Breastfeeding, 1997) and should continue until the infant reaches term corrected age or is able to feed directly on the breast (Ng *et al*, 1999).

1.1 Benefits of Breastfeeding

Breastfeeding is universally accepted as the best method of feeding pre-term infants (WHO, 1992) and the nutritional and immunological superiority of breastmilk is well documented in literature (Lawrence, 1999; Riordan & Auerbach, 1998). Short-term and long-term health benefits associated with feeding breastmilk to pre-term infants include:

- reduced incidence of infections;
- improved feeding tolerance;
- reduced incidence of necrotising enterocolitis;
- reduced incidence of retinopathy of prematurity;
- enhanced neuro-development;
- decreased number of hospital re-admissions;
- enhanced family bonding, maternal involvement and interaction;
- enhanced maternal self-esteem and maternal role attainment.

(British Columbia Reproductive Care Program (BCRCP), 2001)

1.1.1 Benefits for the Infant

Reduced incidence of infection

Pre-term infants are immunologically immature at birth. The immunologic components of breastmilk such as secretory IgA, lysozyme, lactoferrin and interferon, protects the hospitalised very low birth weight (VLBW) infant against the development of infection. One of the three major classes of immunoglobulin occurring in human colostrum and milk, secretory IgA, has been found in significantly higher concentrations in the milk of mothers of pre-term infants compared with milk from mothers of term infants (Gross *et al*, 1981). In infants fed with breastmilk, a significant reduction in infection (57%) and sepsis/ meningitis (53%) compared with formula-fed infants was observed (Hylander *et al*, 1998).

Improved feeding tolerance

The effect of maternal milk on feeding tolerance was studied in 46 of 139 VLBW infants. Infants (n=15) who received maternal milk demonstrated better feeding tolerance as compared with 2 other groups: infants (n=19) receiving formula and infants (n=12) receiving both donor human milk as well as formula (Uraizee & Gross, 1989).

Reduced incidence of necrotizing enterocolitis

Neonatal necrotising enterocolitis (NEC) is a serious gastrointestinal disease that predominately affects pre-term infants.

A prospective multicentre study on NEC was conducted on 926 pre-term infants. The results showed 11/253 (4.3%) infants receiving human milk only, 16/437 (3.7%) infants receiving formula plus human milk, and 24/236 (10.2%) infants receiving formula only had NEC. In this study, infants who received human milk showed a sharp decline in incidence of NEC. In contrast there was no decline in NEC incidence among formula-fed infants from 28 to 36 weeks of gestation. It was suggested that early introduction of breast milk into the diets of pre-term infants could make NEC beyond 30 weeks of gestation a rarity (Lucas & Cole, 1990).

A recent Cochrane systematic review did not find any randomized trial that compared feeding of pre-term infants with their mother's EBM versus formula milk. However, a systematic review of four

trials suggested that pre-term low birth weight infants who received donor human milk were three times less likely to develop NEC (RR 0.34; 95% CI 0.12 to 0.99), and four times less likely to have confirmed NEC (RR 0.25; 95% CI 0.06 to 0.98) than infants who received formula milk (McGuire & Anthony, 2003).

Human milk may decrease the incidence of NEC by decreasing pathogenic bacterial colonization, promoting growth of non-pathogenic flora, promoting maturation of the intestinal barrier and ameliorating the proinflammatory response. Human milk also contains platelet activating factor acetyl hydrolase (PAF-AH), an enzyme which may modify the activity of PAF, a potential mediator of NEC. Human milk interferes with adherence of pathogenic bacteria by providing polymeric IgA and oligosaccharides. In order to promote colonization with nonpathogenic bacteria, breastmilk also contains growth factors for bifidobacterium (Ng, 2001, Claud & Walker, 2001).

In an attempt to improve gastrointestinal function and avoid the risk of intravenous alimentation, many neonatologists use gut priming/stimulation protocols after clinical assessment of the infant. The initiation of a gut priming/stimulation protocol for 7 to 10 days followed by modest advancement of feedings, particularly with human milk, may greatly reduce the incidence of NEC (Schanler *et al*, 1999).

Reduced incidence of retinopathy of prematurity

Breastfed pre-term infants have also been shown to have decreased incidence and severity of retinopathy of prematurity versus formula-fed infants (Hylander, 2001). Breastmilk has a high quantity of polyunsaturated fats (PUFAs), which have antioxidant activity, and may protect retinal membranes.

Enhanced neuro-development

With regards to neuro-development, some studies have shown that pre-term breastfed infants have higher developmental scores at 18 months and higher intelligence quotient (IQ) scores assessed at 7.5 to 8.0 years compared to formula-fed infants (Lucas *et al*, 1992; Lucas *et al*, 1994; Morley *et al*, 1988). In addition, pre-term infants receiving human milk had higher motor scores than formula-fed

infants at 3 months and 12 months and higher cognitive scores at 12 months corrected age (Bier *et al*, 2002).

1.1.2 Benefits for the Mother

Epidemiological studies showed that women who breastfed were less likely to develop premenopausal breast cancer and the longer the duration of breastfeeding the lower the risk of breast cancer (Labbok, 2001). The Collaborative group on hormonal factors in breast cancer in 2002, reported that the risk of breast cancer is reduced by 4.3% (95% CI, 2.9-5.8) for each year that a woman breastfeeds, in addition to a reduction of 7.0% (95% CI, 5.0-9.0) for each birth.

It was also reported that the initiation and physiologic completion of breastfeeding during the first two to seven months postpartum was associated with a significant decrease in the risk of developing ovarian cancer. An average protective level of 20% was reported in the studies (Labbok, 2001).

Breastfeeding mothers also benefited in more rapid post partum weight loss and delayed menstruation. (Kramer & Kakuma, 2002)

Another benefit of breastfeeding for the pre-term infant is that it gives the mother a feeling of worth and involvement in the care of her infant (Gunderson & Kenner, 1995; Meier, 2001). Involvement in providing breast milk to the baby may promote a more satisfactory bonding experience. Most mothers in the study by Kavanaugh *et al* (1997) indicated that the “rewards were worth the effort” as they balanced the emotional benefits with the demands of breastfeeding their pre-term infants. Mothers found the experience rewarding knowing that they were providing the best nutrition for their compromised infant. The perceived infant contentment and tranquility during breastfeeding added to their satisfaction. It also provided them a sense of connection and tangible claim to their infant.

1.2 Background

There are many complex factors, which may influence a woman's decision to breastfeed or formula feed her infant. This set of clinical practice guidelines is created to serve as a guide to enable nurses, especially those caring for sick pre-term infants, to be able to provide parents with complete and current information on the benefits and methods of breastfeeding.

It also aims to provide nurses and other health care professionals with the practical knowledge to provide support to lactating mothers and to promote the practice of breastfeeding, which is essential to the achievement of optimal infant growth and development.

The growth of the extremely low birth weight (ELBW) pre-term infants lags considerably after birth due to many insurmountable impediments to growth, including the stress of relatively frequent pathophysiologic events (eg. hypotension, hypoxia, acidosis, infection, surgical interventions), pharmacologic treatment (eg. corticosteroids) and physiologic immaturity (eg. limited intestinal motility) (Hay *et al*, 1999). Good nutrition is essential to enable adequate growth and development, especially pertinent for the ELBW pre-term infant (Ng *et al*, 1999).

Healthcare professionals need to keep abreast of current information about breastfeeding related issues to be able to provide quality care to the sick pre-term infant. It will further enhance maternal lactation needed for the achievement of optimal infant and child health, growth and development.

1.3 Definitions

Pre-term infant:

Infant born at gestational age of <37 weeks.

(WHO, 1998)

Exclusive breastfeeding:

- requires the infant to be fed breast milk (including expressed milk);
- allows the infant to receive drops, syrups, or powder (vitamins, minerals, medicines) and
- does not allow the infant to receive anything else (water, non-human milk, food-based fluids e.g. glucose).

(WHO, 1998)

Supplementary feeding (if medically indicated):

- requires the infant to be fed breast milk **and**
- allows the infant to receive any food or liquid including non-human milk

1.4 Role of Healthcare Team and Family in Promoting Breastfeeding

Health care professionals should:

- remain updated on current breastfeeding strategies for pre-term infants;
- possess knowledge and skills in the management of pre-term infants and their development;
- provide accurate and consistent breastfeeding information to mothers and their families;
- encourage and promote breastfeeding antenatally;
- initiate and support breastfeeding postnatally during hospitalisation and follow up if necessary.

Lactation consultants should:

- ensure that nurses are adequately trained to help mothers with initiation and maintenance of milk production;
- counsel and assist mothers with complex breastfeeding problems;
- oversee best breastfeeding practice according to the clinical practice guidelines.

Families need to:

- be involved in making informed choices regarding feeding of their infants;
- encourage and support breastfeeding mothers in their new roles and to accept the change in lifestyle with the arrival of the infant;
- acquire knowledge on current breastfeeding practices and care of pre-term infants and their development;
- be aware of availability of breastfeeding support services.

1.5 Scope of the Guidelines

These clinical guidelines are primarily tools to assist healthcare professionals and interest groups who are actively involved in the management of breastfeeding mothers and their pre-term infants in institutions and in the community. They should be adapted to suit the needs of individual patients and mothers.

These guidelines are intended as a simple and readable reference for the management of breastfeeding for both healthy and sick pre-term infants. Knowledge of the MOH Clinical Practice Guidelines on the Management of Breastfeeding for Healthy Full-Term Infants (2002) is a pre-requisite to health professionals utilising these guidelines.

2 DEVELOPMENT OF GUIDELINES

2.1 Training and Guidance

Members of the workgroup attended a two-day interactive training workshop to learn about and discuss the theory and practical issues of developing evidence-based guidelines. This was conducted under the guidance of Dr Edwin Chan and Dr Miny Samuel of the National Medical Research Council Clinical Trials & Epidemiology Research Unit.

2.2 Strategy and Literature Review

Two evidence-based guidelines were reviewed:

- Breastfeeding the Healthy Pre-term Infant \leq 37 weeks by British Columbia Reproductive Care Program (BCRCP), 2001.
- Management of Breastfeeding for the Healthy Full-Term Infants by Ministry of Health, Singapore, 2002.

The workgroup felt that an updated literature search for the specific topics addressed on MEDLINE, EMBASE, Cochrane Library, and CINAHL would be sufficient. Literature from the year 1981 to December 2004 were reviewed. Keywords such as “pre-term”, “breastfeeding”, “breastmilk” were used in the search.

2.3 Evaluation of Evidence and Grading of Recommendations

We have adopted the revised Scottish Intercollegiate Guidelines Network (SIGN) system which gives clear guidance on how to evaluate the design of individual studies, grade each study’s level of evidence (see 2.3.1 and 2.3.2) and assign a grade to the recommendation after taking into account external validity, result consistency, local constraints and expert opinion (see 2.3.3). The extensive reliance on the BCRCP guideline is acknowledged and treated as a very special case of published expert opinion. For areas where available evidence was inconsistent or inconclusive, recommendations were made based on the clinical experience and judgement of the workgroup or expert committee reports.

2.3.1 Individual Study Validity Rating

All primary studies and reviews addressing a particular topic were appraised using a SIGN checklist appropriate to the study's design. These were individually rated for internal validity using the system below:

Rating	Description
++	All or most of the criteria have been fulfilled. Where they have not been fulfilled the conclusions of the study or review are thought very unlikely to alter.
+	Some of the criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are thought unlikely to alter the conclusions.
-	Few or no criteria fulfilled. The conclusions of the study are thought likely or very likely to alter.

2.3.2 Levels of Evidence

Each study is assigned a level of evidence by combining the design designation and its validity rating using the system below:

Level	Type of Evidence
1 ⁺⁺	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias.
1 ⁺	Well conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias.
1 ⁻	Meta-analyses, systematic reviews, or RCTs with a high risk of bias.
2 ⁺⁺	High quality systematic reviews of case-control or cohort studies. High quality case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal.
2 ⁺	Well conducted case-control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal.
2 ⁻	Case-control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal.
3	Non-analytic studies e.g. case reports, case series.
4	Expert opinion.

2.3.3 Grades of Recommendation

The detailed results of each study and mitigating local circumstances were considered in formulation of each recommendation which was then graded using the system below:

Grade	Recommendation
A	At least one meta-analysis, systematic review, or RCT rated as 1 ⁺⁺ , and directly applicable to the target population; or A body of evidence, consisting principally of studies rated as 1 ⁺ , directly applicable to the target population, and demonstrating overall consistency of results.
B	A body of evidence, including studies rated as 2 ⁺⁺ , directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1 ⁺⁺ or 1 ⁺ .
C	A body of evidence including studies rated as 2 ⁺ , directly applicable to the target population and demonstrating overall consistency or results; or Extrapolated evidence from studies rated as 2 ⁺⁺ .
D	Evidence level 3 or 4 ; or Extrapolated evidence from studies rated as 2 ⁺ .

2.3.4 Interpretation of the D/4 Grading

The grading system emphasises the quality of the experimental support underpinning each recommendation. The grading D/4 was assigned in cases where

- it would be unreasonable to conduct a RCT because the correct practice is logically obvious;
- recommendations derived were from existing high quality evidence-based guidelines. We alert the user to this special status by appending the initials of their source e.g. (D/4 - ILCA, WHO).

2.4 Guidelines Review and Revision

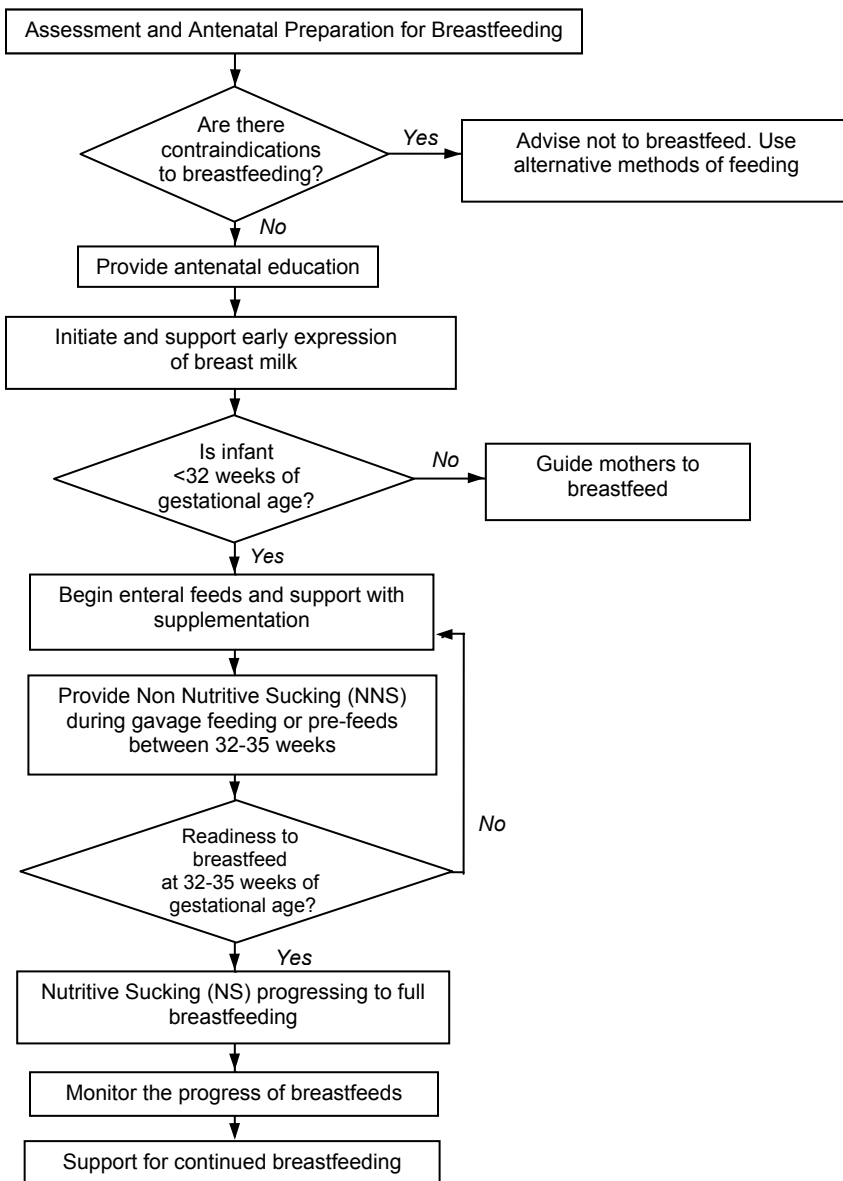
Drafts of the guidelines were circulated to various stakeholders and experts for peer review on validity, reliability and practicality of the recommendations.

These guidelines will be reviewed and revised periodically to incorporate the latest relevant evidence and expert clinical opinion.

2.5 Limitations

These guidelines offer recommendations that are based on current scientific evidence and professional judgement. They are not intended as the legal standard of care.

Users of these guidelines should determine the appropriate and safe patient care practices based on assessment of the circumstances of the particular patient, their own clinical experiences and their knowledge of the most recent research findings.



4.1 Contraindications to Breastfeeding

- Identify maternal and infant contraindications to breastfeeding so as to appropriately advise the mother in relation to the following conditions:

Maternal:

- HIV and certain infectious diseases (eg. untreated tuberculosis);
- substance abuse;
- certain medications (eg. chemotherapy drugs);

Infant:

- galactosaemia;
- phenylketonuria.

(D/4 - WHO, 1998; ILCA, 1999; WHO, 2000)

Rationale:

Refer to the MOH Clinical Practice Guidelines on the Management of Breastfeeding for Healthy Full-Term Infants (2002) for the following:

- Evidence on contraindications to breastfeeding (Section 5.1).
- Medications and breastfeeding (Annex 1).

Cytomegalovirus (CMV)

The potential for transmission of CMV by breast milk from CMV seropositive mothers to their breastfed pre-term infants is an important concern. Evidence from a number of studies shows that CMV is commonly present in breast milk and transmitted to infants. The risk of CMV infection in breastfed premature infants was highest when the mothers shed viable virus in their breast milk. In the study by Vochem *et al*, there was a 59 % rate of transmission of CMV to pre-term infants receiving CMV-positive breastmilk. (Jim *et al*, 2004 ; Mussi-Pinhata *et al*, 2004 ; Hamprecht *et al*, 2001 ; Vochem *et al*,1998,)

Although inactivation of CMV in breastmilk has been demonstrated by freezing or pasteurization, no prospective controlled trials have yet to show efficacy of these methods in preventing severe CMV infection in extremely pre-term infants. (Maschen *et al*, 1999; Friis and Anderson, 1982),

4.2 Antenatal Breastfeeding Education

- Provide parents with complete, current information on the benefits, techniques of breastfeeding and prevention of breastfeeding problems through breastfeeding booklets and individual counselling.

(D/3)

- Provide anticipatory guidance and education to parents and family members of pre-term infants on:
 - initiation and early expression of breastmilk;
 - realistic expectations of breastfeeding pre-term infants;
 - lactation consultant services, breastfeeding support groups, breast pump rental and sales outlets;
 - options for feeding to facilitate parents to make an informed choice.

(D/4 – ILCA, 1999; NHMRC, 1998)

- Educational materials should be free of commercial advertisements related to breast milk substitutes in accordance with SIFECs (Sale of Infant Formula Ethics Committee, Singapore) Code.

(D/4 – SIFECs, 2002)

Rationale:

Benefits of antenatal education

Antenatal education is associated with:

- increased breastfeeding rates;
- increased initiation of breastfeeding and
- longer duration of breastfeeding.

(Kistin *et al*, 1990; Pugin *et al*, 1996)

Parents need to know the advantages of breastfeeding to make an informed choice. All pregnant women and their partners should have the opportunity to discuss feeding methods with their midwives or doctors. (Kistin *et al*, 1990; NHMRC, 1998)

Realistic expectations and an understanding of the pre-term infant's ability to feed at the breast will assist the mother to be patient and to persevere in her efforts. By having correct information on overcoming difficulties, a woman is empowered and confident to succeed in breastfeeding. (Hill *et al*, 1995; NMAA, 2000)

4.3 Breast Care

- Wash areola and nipple with water. Avoid using soap and alcohol. (D/4)
- Avoid antenatal expression of colostrum, nipple rolling or application of breast cream. (D/4)

Rationale:

Soap and alcohol have been shown to cause damage to the tissue and areola. (Lawrence and Lawrence, 1999)

Antenatal expression of colostrum, nipple rolling and application of breast cream have not been shown to be effective in preventing nipple trauma and sensitivity. (Woolridge, 1986)

Nipple rolling and manual expression of colostrum antenatally may stimulate the uterus to contract. (Lawrence and Lawrence, 1999)

5 INITIATION AND SUPPORT OF EARLY EXPRESSION OF BREASTMILK

5.1 ESTABLISHING AND MAINTAINING MILK SUPPLY

5.1.1 Expression of Breastmilk

- Assist and encourage mothers of pre-term infants to express breastmilk early within 6 hours of delivery if medically fit.
(D/4 – BCRCP, 2001)
- Teach the mother the expression, collection and storage of breastmilk.
(D/4 - NHMRC, 1998; ILCA, 1999)
- Provide mothers with information regarding the importance of high quality electric breast pumps for long term milk expression.
(D/4 – BCRCP, 2001)

Rationale:

The primary goal for expression of breastmilk is to develop and maintain an adequate milk supply until her infant can suckle. (Powers and Slusser, 1997)

Ensure premature infants receive all available colostrum and to initiate milk supply. (BCRCP, 2001)

A mother of a pre-term baby does best with a high quality electric breast pump, with automatic intermittent suction. (Spicer, 2001)

5.1.2 Preparation for Expression

- Instruct the mother to wash her hands with soap and water before handling the equipment and expressing. (D/4)
- Instruct the mother to maintain daily personal hygiene. (D/4)
- Massage the entire breast gently, both top and underside, starting from the top and stroking towards the nipple. Do this several times so that the whole breast is massaged. (D/4 - NHMRC, 1998)

Rationale:

It is of prime importance to maintain cleanliness and minimize bacterial contamination in the process of collection. The mother should be instructed to wash her hands and her breasts before handling the equipment or pumping. (Lawrence and Lawrence, 1999)

Providing education for the mothers regarding hygiene is fundamental. It has been shown that bacteria on the skin of the mother's breast, the fingers and the collection containers and the breast pumps are the major sources of contamination of expressed breastmilk. Poor hygiene is one of the major factors contributing to breastmilk contamination. (D'Amico *et al*, 2003)

Breast massage stimulates and facilitates the milk ejection reflex. (Lawrence and Lawrence, 1999; Riordan and Auerbach, 1998)

Applying warm, moist compresses to the breasts and massaging them for a few minutes before milk expression helps to elicit the milk ejection reflex and should be a part of the pumping routine. When the mother is pumping at the hospital, allow skin-to-skin contact with the baby prior to pumping, because this will aid in ejecting milk. (Spicer, 2001)

5.1.3 Cleaning of Breast Pumps and Attachments

- Wash and sterilise all equipment such as pump attachments (plastic breast shield, valve and membrane) and collection bottles before expressing.

(D/4)

Rationale:

Essentially, all parts of the breast pump attachments and breast can be considered as potential sources of contamination. Mothers need to be given clear instructions on the use and cleaning of breast pumps and to avoid touching the membrane on the pump attachment. This will help to minimize contamination of expressed milk. (Lawrence and Lawrence, 1999, D'Amico *et al*, 2003)

5.1.4 Methods of Expressing Breastmilk

- Express milk preferably using a high quality pump with double pumping kit.

(D/4 – BRCP, 2001)

- Teach and show the mother how to pump both her breasts simultaneously.

(D/4)

- Collect colostrum using hand expression.

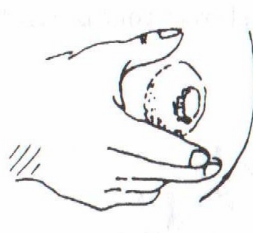
(D/4 – BCRCP, 2001)

- Follow the steps for the different methods of expressing milk:

Hand expressing

- Place the thumb and finger diagonally opposite on the edge of the areola.
- Gently press inward towards the centre of the breast and squeeze the finger and thumb together. Repeat with a rhythmic movement.
- Move fingers around areola and express to empty all sectors of the breast.

Hand expressing



Source: KK Women's and Children's Hospital. 2002. Breastfeed: Give your child a head start. Reprinted with permission.

Electric pump expressing

- Place the breast cup on the areola, centering the nipple.
- Start the suction strength on low, gradually increase the suction strength as long as there is no discomfort.

(D/4 – NHMRC, 1998)

Rationale:

The mother of a pre-term infant does best with a high quality electric breast pump, with automatic intermittent suction and a double collection kit so that both breasts may be emptied simultaneously. It is less time consuming and this practice results in a higher prolactin concentration and greater milk yield than sequential pumping. (Spicer, 2001; Meier, 2001, BCRCP, 2001)

Pumped milk has a higher fat content than dripped or manually expressed milk and in most individuals the volume is also greater. (Lawrence and Lawrence, 1999). Mothers using manual expression have more success obtaining colostrum than with electric pumps. (BCRCP, 2001)

During a pumping session, foremilk is obtained from the start of pumping followed by the hindmilk. Hindmilk may have twofold to threefold greater fat content than foremilk. Hindmilk from mothers of premature infants provides significantly more fat and should preferentially be fed to enhance growth. (Schanler, 2001, Lander, 2003)

5.1.5 Duration and Frequency of Expressing

- Express for 15 minutes for simultaneous double pumping. Express for 30 minutes for single pumping, alternating between breasts every 5 minutes.
(D/4)
- Express 6-8 times in 24 hours including once or twice at night.
(D/4 – BCRCP, 2001)

Rationale:

Mothers should begin expressing milk, preferably within the first 24 hours. Optimal routines for milk expression include eight pumpings per 24 hours. (Powers and Slusser, 1997)

Early and frequent nipple stimulation and breast emptying will ensure that prolactin levels remain elevated and that a good milk supply is established. This should include milk expression once or twice at night when prolactin levels are highest. (Spicer, 2001)

5.1.6 Storage of Breastmilk

- Instruct mothers to store breastmilk in quantities approximately equivalent to the amount the infant requires for each feed.
(D/4)
- Store milk in sterile, hard plastic or glass bottles. Label bottles of expressed milk with name, date and time of expression.
(D/4)
- Use freshly expressed breast milk as soon as possible within 1 hour of expression otherwise it should be refrigerated immediately.
(D/4 – HMBANA, 1993)
- Use all colostrum first, followed by fresh breastmilk if possible.
(D/4)

- Transport breastmilk in an insulated container with ice packs.
(D/4 – NHMRC, 1998)
- Store breastmilk following the recommended guidelines:

<u>Location and temperature</u>	<u>Time</u>
Milk stored at 25°C	4 hr
Milk in a cooler with ice pack (15°C)	24 hr
Fresh milk in refrigerator (4°C)	48 hr
Previously thawed milk in refrigerator (4°C)	24 hr
Frozen milk:	
➤ Freezer with separate door from refrigerator (-5 to -15°C)	3 - 6 months
➤ Deep freezer (-20°C)	6 -12 months

(D/4)

Rationale:

Proper storage of breastmilk in hard plastic or glass containers helps to reduce fat loss and cellular components, thus maximising the preservation of human milk properties and minimises contamination, leakage or spillage. (Tully, 2000; Slusser and Frantz, 2001; Riordan, 2004)

Storing expressed milk at ambient room temperature (25 °C) for four hours does not increase bacterial growth. Storing freshly pumped milk in a small cooler with ice pack for up to 24 hours does not result in excessive microbial growth nor excessive breakdown of protein. (Hamosh *et al*, 1996; HMBANA,1999)

Breast milk should be labelled with date of expression so that the milk expressed earliest in lactation is used first. The earliest expressed milk contains the most protection against infection. (Lang, 2002; Lemons, 2001)

Variation in the contents of fat arises because of the separation of fat from the milk while standing. Therefore, before feeding the milk, one must not allow the fat to separate from the milk and stick to the sides of the container. (Schanler, 2001; Lander, 2003)

5.1.7 Thawing and Warming of Breast milk

- Thaw frozen breast milk in the refrigerator or by placing it in warm water. Do not thaw or warm breast milk in the microwave oven.
(D/4 - NHMRC, 1998)
- Give warmed milk straight away and discard any left over. Do not re-freeze or re-warm breast milk.
(D/4 - NHMRC, 1998)

Rationale:

Milk can be thawed or warmed by standing it in warm water until it reaches the desired temperature. It should never be microwaved since microwaving decreases lysozyme and Immunoglobulin A. Overheating can also destroy lipase, which helps the infant digest fats. (Quan *et al*, 1992)

5.2 STRATEGIES TO MAINTAINING ADEQUATE MILK SUPPLY

5.2.1 Prevention and Management of Low Milk Volume

- Review mother's pumping technique, schedule and type of pump used.
(D/4 – BCRCP, 2001)
- Discuss the need for adequate fluid intake, rest and relaxation techniques with mother.
(D/4 – BCRCP, 2001)
- Provide counselling and emotional support to mother if required.
(D/4 – BCRCP, 2001)
- Determine other possible causes that could affect low milk volume.
(D/4)

Rationale:

Maintaining a sufficient milk supply is frequently a challenge. Stress, separation of mother and infant, late initiation of pumping, fatigue and long term pumping may adversely affect milk volume. (BCRCP, 2001)

Reduction in milk production is commonly observed in mothers of premature infants when lactation has been maintained primarily by milk expression without infant suckling. Findings suggest that over days or weeks, the milk expression procedure may be ineffective in stimulating an optimal milk supply for mothers of pre-term infants. In particular, a breast pump does not mimic the infant's physical closeness and responsiveness, which may be essential for optimal hormonal regulation of milk volume. (Gabay, 2002, Riordan and Auerbach, 1998)

Relaxation and stress reduction are helpful in eliciting let-down during the expression of breast milk. Soft music, a shoulder massage, or guided imagery can make a difference in a mother's pumping success. (Spicer, 2001)

Other maternal causes of poor milk supply may include:

- insufficient glandular development of the breast;
- maternal illness such as postpartum hypothyroidism;
- postpartum haemorrhage;
- retained placenta fragments;
- some medications (including hormonal birth control containing oestrogen);
- maternal smoking or alcohol consumption.

(Lawrence and Lawrence, 1999)

5.2.2 Management of Low Milk Volume with Galactogogues

Low milk volume may be managed as follows:

- Use pharmacological enhancement of prolactin secretion. (D/4)
- Prescribe Metoclopramide (Maxalon) tablets, 10mg, three times a day (tds) over 1-2 weeks. (D/4)
- Prescribe Domperidone (Motilium) tablets, 10 mg, tds for seven days. (A/1⁺)
- Recommend Fenugreek, two capsules three times a day. (D/4)

Rationale:

Galactogogues have been found to aid in initiating and maintaining adequate milk production. Most pharmacological therapies exert their effects through interactions with dopamine receptors, resulting in increased prolactin levels and thereby augmenting milk supply. (Gabay, 2002)

Metoclopramide

Treatment with Metoclopramide results in an increase in prolactin concentration and subsequent improvement of milk flow. Metoclopramide induces the release of prolactin from the anterior pituitary by blocking dopamine's action as an inhibitor of prolactin. The use of Metoclopramide in doses of 10 mg orally 3 times daily, has been documented to be an effective and safe therapy for the initiation and maintenance of lactation. No adverse effects have been reported in infants whose mothers have taken this medication. (Gabay, 2002; Riordan and Auerbach, 1998)

Daily doses of 30mg and 45mg (10mg – 15mg three times a day) resulted in significant increase in serum prolactin and milk yield. However, Metoclopramide can cause maternal fatigue, irritability, depression and extrapyramidal side effects, which include tremor, bradykinesia (slow movements) and other dystonic reactions. (Henderson, 2003; da Silva *et al*, 2001)

Domperidone

Domperidone is a peripheral dopamine antagonist, which has been shown to effectively induce lactation during short-term use. Only very small amounts are detected in the breast milk. It is the only galactagogue available that has been scientifically evaluated through a randomized, double-blind placebo-controlled study. However, further studies are needed to assess the long-term effects of Domperidone. Domperidone may be an alternative to Metoclopramide therapy as it does not readily cross the blood brain barrier and therefore has fewer side effects. (Gabay, 2002; da Silva *et al*, 2001)

Domperidone should be recommended when the expected benefits outweigh any potential risk. In clinical practice, the following regime is recommended - if milk volume is very low, start with a dosage of 20 mg four times a day. If milk volume is moderate, use 10mg four times a day. Once full lactation is achieved, Domperidone can be weaned off gradually by decreasing the dose by 10 mg every 3 to 4 days. If milk volume decreases again, maintain dosage to obtain adequate supply. (BCRCP, 2001)

FDA has cautioned against the use of Domperidone as several published reports and case studies have linked Domperidone to cardiac arrhythmia, cardiac arrest, and sudden death in patients receiving the intravenous form of the drug. (Hampton, 2004)

Fenugreek

Fenugreek (a natural product) as a galactogogue, has been documented in anecdotal reports as far back as 1945. However, formal published clinical data is lacking. Administration of fenugreek should be done only after weighing the risks and the benefits. It has been theorized that fenugreek may affect breast milk production by stimulating sweat gland production, and the breast is a modified sweat gland. The recommended dose of fenugreek for use as a galactogogue is 2 to 3 capsules three times daily. Reported adverse events are rare and may include a maple-like odour to urine and sweat, diarrhoea, and aggravation of asthmatic symptoms. Use of fenugreek during pregnancy is contraindicated because of its uterostimulant effects. (Gabay, 2002)

6.1 BEGIN ENTERAL FEEDS

- Provide intermittent or continuous enteral feeds with indwelling naso-gastric (NG) / Oro-gastric tubes. (D/4 - BCRCP, 2001)

Rationale:

The ability to feed depends upon a coordinated sucking, swallowing and breathing pattern. In pre-term infants less than 32 weeks of gestation, this ability is usually not effective enough to sustain full oral feeds. In the interim, infants are fed by gavage tubes until they are mature enough to breast feed. (Pinelli and Symington, 2003)

NG gavage tubes are used to provide nutrition (breastmilk or formula) to an infant who is unable to take the full amount of feed from the breast or bottle or when breastfeeding is not possible (mother and infant are separated). It may be used to provide all/most feeds or to provide occasional supplementation. (BCRCP, 2001)

Continuous feeding may waste up to 50% of fat coated in tubing as milk is not homogenized. The infusion syringe should be placed at an angle to minimize the fat loss. (Landers, 2003)

Milk feeding given by the intermittent bolus gavage method will enable infants to reach full enteral feeds sooner. However, it is essential to weigh the clinical risks and benefits when using either continuous or intermittent bolus method for the initiation of feeds for infants with feed intolerance. (Premji and Chessell, 2002)

6.1.1 Supplementation During Enteral Feeds

- Provide supplementation of protein, fat, calcium and phosphate, and carbohydrate to meet the nutritional requirements of the pre-term infant. (A/1⁺)
- Provide infant with supplementation of human milk fortifier (HMF) or formula milk as prescribed. (A/1⁺)
- Add fortifier immediately before feeding followed by thorough mixing when the infant is prescribed HMF. (D/4)

Rationale:

Although breast milk is the perfect food for healthy term infants, smaller pre-term infants usually require some additional nutrients. (BCRCP, 2001; Kerr and Kick, 2001) The nutritional requirements (calories, protein and minerals) of these infants, who are born with relatively impoverished nutrient reserves and are subject to additional metabolic stresses compared with term infants, may not be fully met by enteral feeding with human milk. (Hay, 1994; Schanler, 2001)

The nutrient content of premature human milk provides insufficient quantities of protein, sodium, phosphate and calcium to meet the estimated needs of the infant. Fortification of human milk with more than one nutritional supplement or just protein supplementation of human milk in preterm infants results in small but statistically significant increases in weight gain, linear growth and head growth. (Kuschel and Harding, 2000)

Powdered human milk fortifiers have higher protein content and net protein retention. Calcium, phosphorous and zinc contents are also higher compared to the liquid fortifiers. Powdered fortifiers have the advantage of not diluting the mother's milk. (Kerr and Kirk, 2001)

6.2 Assessment: Determining Readiness to Breastfeed

- Assess readiness for breastfeeding based on the following parameters: gestational age, physiological status, sleep/ wake states, sucking patterns, and behavioural cues.
(D/4 - BCRCP, 2001)

6.2.1 Gestational Age

- At 32 to 35 weeks gestational age, breastfeeding can be initiated.
(D/4 - BCRCP, 2001)

Rationale:

Infants at 32-36 weeks gestational age are capable of mature nutritive sucking rhythm. The ability to coordinate and sustain suck, swallow and breathing pattern is essential for successful oral intake. (McCain, 2003; Jones *et al*, 2002)

6.2.2 Physiologic Stability

- Assess the physiological status of the infant prior to, during and following each feed (able to regulate colour, heart rate and respiration).
(D/4 - BCRCP, 2001)
- Observe for instability of the autonomic system (tachypnoea, pallor, mottling, apnoea, bradycardia, oxygen desaturation).
(D/4 - BCRCP, 2001)

Rationale:

Cardiorespiratory regulation is immature in pre-term infants and as a consequence, apnoea and bradycardia may occur. Therefore it is important to monitor continuously for heart and respiratory changes during feeding. To feed orally, an infant must be able to coordinate sucking-swallowing-breathing and to maintain cardiorespiratory stability. (McCain, 2003)

6.2.3 Sleep/Wake States

- Assess the infant's behaviour and hunger states that indicate readiness to feed.
(D/4 - BCRCP, 2001)
- A feed should be offered when an infant comes to an awake and quiet state (eyes open, without movement and fussing).
(D/4)

Rationale:

For a pre-term infant to be successful at oral feeding, he/she must be in an appropriate state of alertness or readiness before feeding is attempted (Jones *et al*, 2002). The quiet alert state enhances feeding success and allows for optimal parent-infant interaction (McCain, 2003)

6.2.4 Sucking Patterns

- Assess infant's sucking patterns on a pacifier, finger and/or at the breast.
(D/4 - BCRCP, 2001)

Rationale:

Maturation of nutritive sucking occurs when the infant engages in more efficient sucking. The coordination of sucking and swallowing is a matter of maturity; the initial, non-nutritive sucking at the breast will become nutritive sucking once coordination is present. (Cahill & Wagner, 2003)

6.2.5 Motor Cues

- Assess infant's stable motor cues (good posture and motor tone, synchronous smooth movements, grasping, hand to mouth activity, suck searching and hand holding).
(D/4 - BCRCP, 2001)

- Observe for instability of the motor system (generalised hypotonia, hyperextension of extremities, finger splay and facial grimace).

(D/4 - BCRCP, 2001)

Rationale:

Learning the pre-term infant's motor cues is important to enable the care-givers to respond appropriately to the infant's needs. Infant behaviour is affected by a variety of factors. These can be difficult to interpret due to immaturity of the central nervous system as well as the lack of energy in displaying behavioural responses. (BCRCP, 2001; Mulligan, 2000)

6.3 NON NUTRITIVE SUCKING (NNS)

- Provide the pre-term infant (recommended gestation 32 to 35 weeks) with opportunities for NNS (e.g. have infant suck on emptied breast or pacifier during gavage feeding or pre-feeds).
(A/1⁺⁺)

(Refer to Appendix 1 – Non nutritive Sucking Algorithm)

Rationale

NNS refers to sucking activity when no fluid or nutrition is delivered to the infant. NNS is used for the transition from gavage to breast/bottle feeding in pre-term infants. (BCRCP, 2001)

The rationale for this intervention is that NNS facilitates maturation of the sucking reflex (strengthen the suck), improves digestion (stimulates secretion of enzymes/hormones), facilitates transition from tube to nipple feeds, improves weight gain, and thus decreases length of hospital stay in pre-term infants. (Pinelli and Symington, 2003)

6.3.1 KANGAROO MOTHER CARE (KMC)

- Assess infant's physiological stability and medical condition prior to KMC (skin-to-skin cuddling).
(D/4 - BCRCP, 2001)
- Assist the mother to hold the infant with diaper only, skin to skin, upright on the mother's chest.
(D/4 - BCRCP, 2001)
- Refer to WHO guidelines on KMC (refer to Appendix 3).
(D/4 - WHO, 2003)

Rationale:

KMC is defined as skin-to-skin contact between a mother and her low birth weight infant. (Kirsten *et al*, 2001)

KMC can keep the infant warm and maintain the heart rate, breathing rate and oxygen saturation. It is found to increase the alertness of the infant, allowing earlier, more frequent opportunities for progression from non nutritive sucking at the breast to breastfeeding. This enhances weight gain, thus resulting in earlier discharge. KMC also enhances mother and baby bonding by increasing the confidence of the mother in caring for her infant and thus improving the duration of lactation. (Hurst *et al*, 1997; Conde – Agudelo, 2000; Chen *et al*, 2000; Wight, 2003)

6.4 NUTRITIVE SUCKING (NS) PROGRESSING TO FULL BREASTFEEDING

- Initiate breastfeeding when an infant reaches 32 to 35 weeks corrected gestational age, is eager to suck, has sustained alertness and is physiologically stable.
(D/4 – BCRCP, 2001)

- Allow gradual progression of breastfeeding in the following sequence:
 - NS time < 5 mins followed by supplementation with total volume of enteral feed
 - NS time 5 to 10 minutes followed by supplementation with three quarter volume of enteral feed
 - NS time 10 to 15 minutes followed by supplementation with half volume of enteral feed
 - NS time 15 to 20 minutes with no supplement required
 - Subsequent feeding times may be early, based on the infant's cues

(D/4 - BCRCP, 2001)
- Assess infant behaviour during feeding. Stop breastfeeding if infant manifests stress behaviours.

(D/4 - BCRCP, 2001)
- Provide gavage feeding with EBM, EBM fortified with human milk fortifier, pre-term formula or formula milk as prescribed.

(D/4)
- Feed with cup or bottle when mother is unavailable and infant is on oral feeds.

(D/4)

(Refer to Appendix 2 - Nutritive Sucking Algorithm)

Rationale:

NS is sucking activity that has a well-defined suck-pause pattern associated with negative intra-oral pressure sufficient to deliver liquid from the nipple. It requires greater coordination between suck, swallow, and respiratory effort. At 32 to 35 weeks, the mechanisms of suck, swallow and breathe become more functionally coordinated. The rhythm of the sucking pattern is organised with a continuous sucking burst, progressing to intermittent sucking with pauses becoming longer (one suck per second) over the course of a feed. (BCRCP, 2001; Medoff-Cooper *et al*, 2000)

Suckling for several minutes before milk ejection occurs and falling asleep shortly after a few nutritive sucks is a maturational phase that precedes the infant's ability to consume larger volumes. (BCRCP, 2001)

Cup feeding is a method to feed premature and low birth weight infants until they are strong and mature enough to be exclusively breastfed. Premature infants demonstrate better physiologic stability during cup feedings, with less increase in heart rate, better oxygenation and the ability to pace their own feeding during cup feeds. (Marinelli *et al*, 2001; Wight, 2003)

7.1 OBSERVATION OF BREASTFEEDING

- Observe the following during breastfeeding sessions:
 - Correct positioning of infant at the breast
 - Ability of infant to maintain physiologic stability during feeds
 - Ability of infant to nuzzle or lick the breast during the early feed.

(D/4 - BCRCP, 2001)

- Observe the following indicators for adequate intake/satiation cues:
 - Mother's breasts should feel softer after the infant has breastfed
 - Active NS for 15 mins or more with frequent audible swallowing
 - Adequate output (more than 6 wet diapers/day)
 - Daily weight gain (more than 15g/kg/day)
 - Test weighing.

(D/4 - BCRCP, 2001; WHO, 2003)

Rationale:

Pre-term infants are often able to pace themselves better at the breast than the bottle. They demonstrate greater physiologic stability during breastfeeding than bottle feeding, due to the ability to control the rate of milk flow during breastfeeding. (Meier, 1996; Bier *et al*, 1997; BCRCP, 2001)

Breastfeeding is a learned behaviour that is interactive between mother and infant. The infant may nuzzle or lick the breast during the early feed, which means that the infant is “learning”. The goal of *later* breastfeeding sessions is to ensure that the infant consumes adequate volumes of milk in preparation for discharge. The transition from early to later breastfeeding is gradual and depends on the infant's response to the feeding situation. Management strategies are individualised and based on continuous assessment of both infant and mother. (BCRCP, 2001)

Breastfeeding sessions provide opportunities for the mother to learn about:

- correct positioning,
- behaviour and ability of the premature infant
- hunger cues
- what feeding should look and feel like
- breastfeeding requiring time, patience, and collaboration between herself and her infant.

(BCRCP, 2001)

Test weighing may be done periodically before and after feeding under identical conditions to estimate the amount of milk intake. The weight (in grams) after feeding is roughly equivalent to the volume of milk (in mls) consumed. It helps to identify milk transfer problems and positive findings can be reassuring to mothers and healthcare professionals. (BCRCP, 2001; Meier, 1996; Kavanaugh and Meier, 1995)

7.2 Techniques on Breastfeeding

- Create a suitable environment that facilitates breastfeeding as the pre-term infant is particularly sensitive to his/her surroundings:
 - Provide a comfortable upright chair and footstool for the mother.
 - Provide pillows to position the infant at breast level and for the mother's comfort.
 - Create a quiet relaxing space.
 - For the infant who is able to regulate his/her temperature, assist the mother to undress and unwrap the infant to encourage a wakeful state.

(D/4 – BCRCP, 2001)

- Show and teach the mother how to adopt a comfortable position and ensure that the infant is positioned correctly. The infant is held at the level of the breast and body facing the breast with head and body aligned (see next page on different positions).

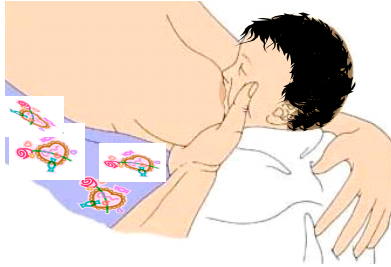
(D/4)

- Show and teach the mother to position the infant at the breast using the modified cradle or football hold, or with dancer hand hold.

(D/4 – BCRCP, 2001)

Positions for breastfeeding

Dancer hand position



Modified cradle hold position – ideal for small infants and newborns



Source: WHO/UNICEF. 1993. Breastfeeding counselling: A training course

Football position

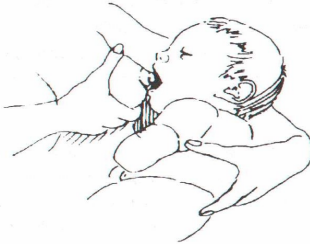


Source: KK Women's and Children's Hospital. 2002. Breastfeed: Give your child a head start. Reprinted with permission.

- Guide the mother to ensure effective latching is achieved.
(D/4 – BCRCP, 2001)



Support the infant at the breast level with his body turned on the side and his mouth facing the nipple.



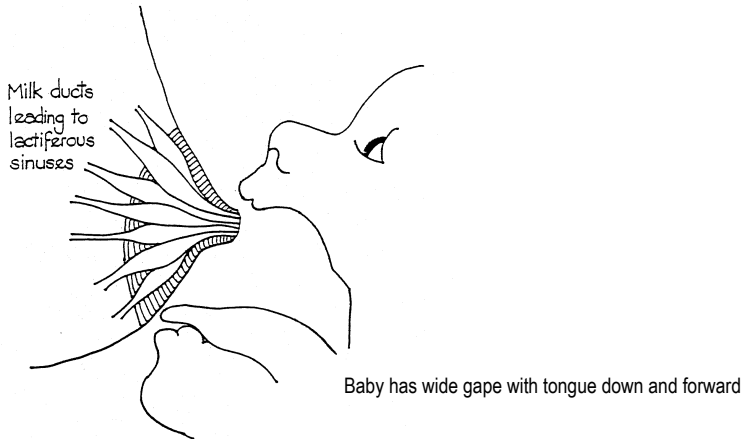
Support the breast with four fingers below and the thumb by the side, away from the areola. Tease the infant's lower lip with the nipple to get him to open his mouth.



Bring the infant to the breast when he opens his mouth wide. Make sure that the infant grasps as much of the areola as possible.

Source: KK Women's and Children's Hospital. 2002. Breastfeed: Give your child a head start. Reprinted with permission.

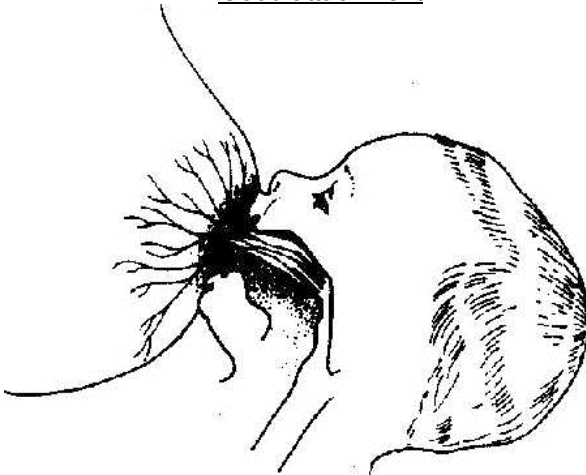
Attaching to the breast



© Ros Escott

Source: Escott, R. 1989. Positioning, attachment and milk transfer. Reprinted with permission.

Good attachment



Source: WHO/UNICEF. 1993. Breastfeeding counselling: A training course.

Rationale:

Modified cradle and football hold makes a good position for pre-term and smaller infants. It is easier for the mother to latch her infant on in this position because it gives her more control in guiding the infant onto the breast. (Eastman, 2000)

The dancer hand position is used for providing jaw and cheek support of the infant at the breast. It helps to free the thumb and fingers for cheek support. (BCRCP, 2001)

The dancer hand position may be adapted using the following steps:

- Support mother's breast with the "C" hold, thumb on top and four fingers underneath.
- Slide her hand forward, supporting the breast with three, rather than four fingers.
- Her index finger and thumb should now be free in front of the nipple.
- Bend her index finger slightly so it gently holds the baby's cheek on one side while the thumb holds the other cheek.
- The mother is cradling her baby's head in a "U" of her index finger and thumb, with the baby's chin resting at the bottom of the "U."

Obtaining an effective latch with a pre-term infant often takes many attempts and increased gestational maturity to obtain an effective and sustained latch. (BCRCP, 2001)

7.3 Frequency and Duration of Breastfeeding

- Nurse the pre-term infant on demand and/or every 2-3 hourly whenever the infant shows signs of hunger, such as waking from sleep, hand to mouth, rooting, sucking or crying.
(D/4 – BCRCP, 2001)
- Allow the pre-term infant to nurse for 15 minutes, or until the infant detaches from the breast or falls asleep.
(D/4 – BCRCP, 2001)

Rationale:

The infant determines the duration of breastfeeding and the following are the benefits of cue-based demand feeds:

- Promote parent's learning as they are able to identify and respond to their infant's cues prior to hospital discharge.
- Earlier discharge
- Fewer gavage feeds
- Parents develop feelings of competence and adequacy in providing care.

(BCRCP, 2001)

8.1 Discharge Planning

- Plan for discharge when the infant is:
 - medically fit;
 - physiologically stable;
 - able to maintain normal temperature in an open environment;
 - on full oral feeds and achieves a weight gain of 20 to 30 gm/kg/day
 - approximately 2 kg in weight;
 - at least 35 weeks (corrected gestational age); and
 - comfortably and competently cared for and fed by parents.
 - no recent major changes in medications or oxygen administration have occurred.

(D/4 - BCRCP, 2001)

- Develop an individualised, multidisciplinary discharge plan with parents, lactation consultant, dietician and physician. (D/4)
- Refer to support group to encourage continuation of breastfeeding. (D/4)
- Arrange for equipment such as an electric breast pump kit, and milk storage bottles if necessary. (D/4)
- Conduct a telephone followup after discharge until the infant is fully breastfed, if necessary. (D/4)

Rationale:

The goal of the discharge plan is to assure successful transition to home care. (AAP, 1998)

Referral to a support group or a peer counselling programme can be very effective in aiding the mother to address difficulties with breastfeeding and gives the mother added knowledgeable support. (Wight,2003)

The mother may use the electric breast pump after breastfeeding to ensure that the breasts are stimulated adequately and that the milk supply would be maintained. (Wight, 2003; Meier and Margurten, 1993)

Post discharge telephone consultation is ideal to alleviate maternal anxiety, which may compromise the infant's growth. (Meier and Margurten, 1993)

8.2 Support for Continued Breastfeeding

- Provide followup and support for continued breastfeeding during the infant's post discharge medical visits.
(D/4 - BCRCP, 2001)
- Support continued breastfeeding during any re-hospitalisation of the mother or infant.
(D/4 - ILCA, 1999)
- Provide a list of available support resources:
 - helplines;
 - lactation consultants;
 - breastfeeding support groups;
 - parents support groups; and
 - breast pump rental and sales outlets.
(D/4 - ILCA, 1999)
- Refer to a lactation consultant for common problems that may interfere with continued breastfeeding.
(D/4 - ILCA, 1999)

Rationale:

Mothers of pre-term infants often experience challenges that are unique and stressful as they work towards achieving optimal nutrition, physical and cognitive development for their infants. Parents require not only a detailed plan of caring and parenting for their pre-term baby after discharge but also support, encouragement and assistance for on-going care and breastfeeding. (Worgan and Jackson, 2002)

If hospitalisation of the breastfeeding mother or infant is necessary, every effort should be made to maintain breastfeeding, preferably directly or by pumping the breasts and feeding expressed breast milk, if possible. (AAP, 1997)

Lactation consultants are equipped with skills and knowledge to develop treatment plans for breastfeeding problems. (Lawrence and Howard, 2001)

Hospital and institution administrators should consider these guidelines in their in-house quality assurance programmes. Nurses should critically review the implications of these guidelines for their routine care delivery, trainee teaching and patient education needs.

9.1 Parameters for Evaluation

In the management of pre-term breastfeeding, quality of care may be defined as an increase in the following rates. It is suggested that the following parameters are monitored preferably on a monthly basis:

Initiation of expression of breastmilk

$$\text{Percentage of women who initiated expression of breast milk within the first week of delivery} = \frac{\text{Number of mothers who initiated expression of breast milk within the first week of delivery}}{\text{Number of pre-term live births}} \times 100\%$$

Provision of expressed breastmilk (within the first week of delivery)

$$\text{Percentage of infants receiving expressed breast milk within the first week of delivery} = \frac{\text{Number of infants receiving expressed breast milk within the first week of delivery}}{\text{Number of pre-term live births}} \times 100\%$$

Provision of expressed breastmilk (up to time of discharge)

$$\text{Percentage of infants receiving expressed breast milk up to time of discharge} = \frac{\text{Number of infants receiving expressed breast milk up to time of discharge}}{\text{Number of pre-term live births}} \times 100\%$$

Breastfeeding (at time of discharge)

$$\text{Percentage of infants breastfeeding at time of discharge} = \frac{\text{Number of infants breastfeeding at time of discharge}}{\text{Number of pre-term live births}} \times 100\%$$

It is suggested that the following parameters are monitored preferably on a periodic basis:

Breastfeeding counselling

$$\text{Percentage of women who are provided with breastfeeding counselling before mother's discharge} = \frac{\text{Number of mothers provided with breastfeeding counselling before mother's discharge}}{\text{Number of pre-term live births}} \times 100\%$$

Breastfeeding (at six weeks)

$$\text{Percentage of infants breastfeeding at six weeks} = \frac{\text{Number of infants breastfeeding at six weeks}}{\text{Number of infants sampled}} \times 100\%$$

Breastfeeding (at four months)

$$\text{Percentage of infants breastfeeding at four months} = \frac{\text{Number of infants breastfeeding at four months}}{\text{Number of infants sampled}} \times 100\%$$

9.2 Management Role

Hospital and institution administrators, together with quality assurance teams, should ensure that outcome indicators are met and benchmarked against hospitals or institutions that perform well.

It is expected that these guidelines will be adopted after discussion with hospital and institution administrators and clinical staff. They may review how these guidelines may complement or be incorporated into their existing institution protocols.

Feedback may be directed to the Ministry of Health for consideration in future reviews.

11 REFERENCES

American Academy of Pediatrics Committee on Drugs (2001) Transfer of drugs and other chemicals into human milk. *Pediatrics*, 108(3): 776-89.

American Academy of Pediatrics Workgroup on Breastfeeding (1997) Breastfeeding and the Use of Human Milk. *Pediatrics*. 100(6) 1035-9.

American Academy of Pediatrics (2005) Breastfeeding and the use of human milk. *Pediatrics* 115(2): 496-506

Bier JAB, Ferguson AE, Marales Y, Liebling JA, Oh W and Vohr BR (1997) Breastfeeding infants who were extremely low birth weight. *Pediatrics*. 100(6): 1-4.

Bier JAB, Oliver T, Ferguson AE and Vohr BR (2002) Human milk improves cognitive and motor development of premature infants during infancy. *Journal of Human Lactation*, 18(4): 361-367

British Columbia Reproductive Care Program (BCRCP) (2001) *Nutrition Part II - Breastfeeding the Healthy Preterm Infant \leq 37 Weeks*

Cahill JB and Wagner CL (2003) Challenges in Breastfeeding Part 2- Neonatal Concerns. *Journal of Paediatrics, Obstetrics and Gynaecology*. 5-13.

Callen J and Pinelli J (2005) A review of the literature examining the benefits and challenges, incidence and duration, and barriers to breastfeeding in pre-term infants. *Advanced Neonatal Care* 5(2): 72-88

Chen CH, Wang TM, Chang HM, Chi CS. 2000. The effect of breast- and bottle-feeding on oxygen saturation and body temperature in preterm infants. *Journal of Human Lactation*, 16(1): 21-27.

Claud EC and Walker WA (2001) Hypothesis: inappropriate colonization of the premature intestine can cause neonatal necrotizing enterocolitis. *The FASEB Journal*, 15(8): 1398-1403.

Conde-Agudelo A, Diaz-Rossello JL and Belizan JM (2000) Kangaroo mother care to reduce morbidity and Mortality in low birthweight infants. Cochrane Review. In *The Cochrane Library*, Issue 4, 2000. Oxford: Update Software.

<http://www.nichd.nih.gov/cochrane/neonatal/conde-agudelo/conde-agudelo.htm> Last accessed on 01/10/03.

D'Amico C, DiNardo CA and Krystofiak, SMS. (2003) Preventing contamination of breast pump kit attachments in the NICU. *The Journal of Perinatal & Neonatal Nursing*, 17(2): 150-157.

Da Silva, OP, Knoppert, DC, Angelini, MM and Forret, PA. (2001) Effect of domperidone on milk production in mothers of premature newborns: a randomized, double-blind, placebo-controlled trial. *Canadian Medical Association Journal*, 164(1): 17-21..

Eastman A. (2000) The mother- baby dance: positioning and latch-on. *Leaven* 36(4): 63-68.

Eteng MU, Ebong PE, Eyong EU and Ettarh RR (2001) Storage beyond three hours at ambient temperature alters the biochemical & nutritional qualities of breastmilk. *African Journal of Reproductive Health*, 5(2):130-134.

Friis H and Andersen HK (1982) Rate of inactivation of CMV in raw banked milk during storage at -20°C and pasteurization. *British Medical Journal*, 285: 1604-1605.

Gabay, MP. (2002) Galactagogues: Medications that induce lactation. *Journal of Human Lactation*. 18(3): 274-279.

Gross SJ, Buckley RH and Wakil SS (1981) Elevated IgA concentration in milk produced by mothers delivered of preterm infants. *Journal of Pediatrics*. 99(3):389-393.

Gunderson LP, Kenner C (1995) *Care of the 24-25 Week Gestational Age Infant - A Small Baby Protocol*. NICU Ink Book: Petaluma

Hamosh M, Ellis LA, Pollock DR, Henderson TR and Hamosh P (1996) Breastfeeding and the working mother. Effect of time and temperature of short-term storage on proteolysis, lipolysis, and bacterial growth in milk. *Pediatrics*, 97(4): 494-98.

Hamprecht K, Maschmann J, Vochem M, Dietz K, Speer CP and Jahn G. (2001) Epidemiology of transmission of cytomegalovirus from mother to preterm infant by breastfeeding. *The Lancet*, 357(9255): 513-518.

Hampton, T (2004) FDA warns against breast milk drug. *JAMA*.292(3): 322-323.

Hay WW, Lucas A, Heird WC, Ziegler E, Levin E, Grave GD, Catz CS and Yaffe SJ. (1999) Workshop summary: Nutrition of the extremely low birth weight infant. *Pediatrics*, 104(6): 1360-1368.

- Henderson, A. (2003) Domperidone – discovering new choices for lactating mothers. *WHONN Lifelines*. 7(1):54-60. Available in: <http://awhonnlifelines.awhonn.org/cgi/content/full/7/1/54> [Last accessed on 26/11/04]
- Hill PD, Andersen JL and Ledbetter RJ (1995) Delayed Initiation of Breastfeeding the Preterm Infant. *Journal Perinatal and Neonatal Nursing* 9(2): 10-20.
- Human Milk Banking Association of North America (1993) *Recommendations for Collection, Storage, and Handling of a Mother's Milk for Her Own Infant in the Hospital Setting*. The HMBANA, Inc.
- Hurst NM, Valentine CJ, Renfro L, Burns P, Ferlic L. 1997. Skin-to-skin holding in the neonatal intensive care unit influences maternal milk volume. *Journal of Perinatology*, 17(3): 213-217.
- Hylander MA, Strobino DM and Dhanireddy R (1998) Human milk feedings and infection among very low birth weight infants. *Pediatrics*. 102(3): e38
- Hylander MA, Strobino DM, Pezzullo JC and Dhanireddy R (2001) Association of human milk feedings with a reduction in retinopathy of prematurity among very low birthweight infants. *Journal of Perinatology*, 21:356-362.
- International Lactation Consultant Association (1999) *Evidence-based guidelines for breastfeeding management during the first fourteen days*. International Lactation Consultant Association, USA.
- Jim WT, Shu CH, Chiu NC, Kao HA, Hung HY, Chang JH, Peng CC, Hsieh WS, Liu KC and Huang FY (2004) Transmission of cytomegalovirus from mothers to preterm infants by breast milk. *Pediatric Infectious Disease Journal* 23(9): 848-851.
- Jones MW, Morgan E and Shelton JE (2002) Dysphagia and oral feeding problems in the premature infant. *Neonatal Network*, 21(2): 51-57.
- KK Women's & Children's Hospital (2002) *Handbook of drug used in Lactation*. Singapore
- Kavanaugh K and Meier P (1995) Getting Enough: Mothers' Concerns About Breastfeeding a Preterm Infant After Discharge. *JOGNN*. 24(1): 23-32.
- Kavanaugh K, Meier P, Zimmermann B and Mead L. (1997) The rewards outweigh the efforts: breastfeeding outcomes for mothers of preterm infants. *Journal of Human Lactation* 13(1): 15-21.

Kerr BA and Kirk J (2001) Breastfeeding in the preterm infant.1-7. Available at: <http://www.dcmsonline.org/jax-medicine/2001journals/dec2001/breastfeeding.htm>. [Last accessed on 18/09/03]

Kirsten D and Bradford L (1999) Hindmilk feedings. *Neonatal Network*, 18(3): 68-70.

Kistin N, Benton D, Rao S and Sullivan M. (1990) Breast-feeding rates among black urban low-income women: effect of prenatal education. *Pediatrics*, 86(5): 741-46.

Kramer MS and Kakuma R. (2002) Optimal duration of exclusive breastfeeding (Cochrane Review). In: *Cochrane Library*, Issue 3. Oxford: Update Software [Last assessed on 28/09/2002]

Kuschel CA and Harding JE. (1998) Multicomponent fortified human milk for promoting growth in preterm infants (Cochrane Review). In: *The Cochrane Library, Issue 4*, 1998. Oxford: Update Software. Available at: <http://www.nichd.nih.gov/cochraneneonatal/kuschel/kuschel.HTM>. [Last accessed on 01/10/03]

Labbok M (2001) Effects of breastfeeding on the mother. *Pediatric Clinics of North America*, 48(1): 143-58.

Landers S. (2003) Maximising the benefits of human milk feeding for the preterm infant. *Pediatric Annals*, 32(5):298-306.

Lang S (2002) Breastfeeding Special Care Babies. (2nd ed). Toronto.

Lang S, Lawrence CJ and L'E Orme R. (1994) Cup feeding: an alternative method of infant feeding. *Archives of Disease in Childhood*, 71: 365-69.

Lawrence RA and Howard CR (2001) The role of lactation specialists- A guide for physicians. *Pediatric Clinics of North America*, 48(2): 517-23.

Lawrence RA and Lawrence RM (1999) *Breastfeeding: A Guide for the Medical Profession* (5th ed) St Louis: Mosby.

Lemons PK. (2001) Breast Milk and the Hospitalized Infant: Guideline for Practice. *Neonatal Network The Journal of Neonatal Nursing*, 20(7): 47-52.

Lucas A and Cole TJ. (1990) Breast milk and neonatal necrotising enterocolitis. *Lancet*. 336: 1519-23.

Lucas A, Morley R, Cole TJ, Lister G and Leeson-Payne C (1992) Breastmilk and subsequent intelligence quotient in children born preterm. *Lancet*, 339:261-264.

Lucas A, Morley R, Cole TJ and Gore SM (1994) A randomised multicentre study of human milk versus formula and later development in preterm infants. *Arch Dis Child*, 70: F141-F146

Marinelli KA, Burke GS and Dodd VL. (2001) A comparison of the safety of cupfeedings and bottlefeedings in premature infants whose mothers intend to breastfeed. *Journal of Perinatology*, 21: 350-355.

Maschmann J, Speer CP, Jahn G and Hamprecht K (1999) Inactivation of cytomegalovirus (CMV) in breast milk. *Pediatric Research*, 45(6): 924.

McCain GC (2003) An evidence-based guideline for introducing oral feeding to healthy preterm infants. *Neonatal Network*, 22(5): 45-50.

McGuire W and Anthony MY (2003) Donor human milk versus formula for preventing necrotising enterocolitis in preterm infants: systematic review. *Arch Dis Child Fetal Neonatal Ed*. 88: F11-F14.

Medical Encyclopedia (2003) Premature infant. 1-4.
Available at: <http://www.nlm.nih.gov/medlineplus/ency/article/001562.htm>. [Last accessed on 20/09/03]

Medoff-Cooper B, Mcgrath JM and Bilker W (2000) Nutritive sucking and neurobehavioral development in preterm infants from 34 weeks pca to term. *MCN*. 25(2): 64-70.

Meier PP (1996) Suck-breathe patterning during bottle and breastfeeding for preterm infants. International Congress and Symposium series no. 215:9-20.

Meier PP (2001) Breastfeeding in the special care nursery : premature infants with medical problems. *Pediatric Clinics of North America*, 48(2): 425-442.

Ministry of Health (MOH) Clinical Practice Guidelines Workgroup (2002) Management of Breastfeeding for Healthy Full -Term Infants. *MOH Nursing Clinical Practice Guidelines 2/2002* Singapore: MOH

Mulligan LaRossa M (2000). Understanding preterm infant behavior in the NICU. *Emory Developmental Continuity Program*. 1-3.
Available at: <http://www.emory.edu/PEDS/NEONATOLOGY/DCP/nicubeh.htm>. [Last accessed on 06/06/04]

Mussi-Pinhata MM, Yamamoto AY, do Carmo Rego MA, Pinto PC, Motta MS and Calixto C. (2004) Perinatal or early-postnatal cytomegalovirus infection in preterm infants under 34 weeks gestation born to CMV- seropositive mothers within a high-seroprevalence population. *J. Pediatric*, 145(5): 685-688.

National Health and Medical Research Council. (1998) *Infant feeding guidelines for health workers*. National Health and Medical Research Council, Australia.

Ng SCY (2001) Review article: Necrotizing enterocolitis in the full-term neonate. *J. Paediatric Child Health*, 37: 1-4.

Ng SCY, Saigal S and Atkinson SA. (1999) The influence of breast compared to formula feeding of preterm infants until three months corrected age on growth and body composition during the first year of life. *Singapore Paediatric Journal*, 41(1): 16-20.

Nursing Mothers' Association of Australia. (2000) *Resource booklet for breastfeeding policies and patient care guidelines*. Nursing Mothers' Association of Australia, Australia.

Ogundele MO. (2002) Effects of storage on the physicochemical & antibacterial properties of human milk. *British Journal of Biomedical Science*, 59(4): 205-211.

Pinelli J and Symington A. (2001) Non-nutritive sucking for promoting physiologic stability and nutrition in preterm infants (Cochrane Review). In: *The Cochrane Library*, Issue 3, 2001. Available at: <http://www.nichd.nih.gov/cochraneneonatal/Pinelli/Pinelli.HTM>. [Last accessed on 26/01/05]

Powers NG and Slusser W (1997) Breastfeeding update 2: Clinical lactation management. *Pediatrics in Review*, 18(5): 147-161.

Premji S and Chessell L. (2001) Continuous nasogastric milk feeding versus intermittent bolus milk feeding for premature infants less than 1500 grams. (Cochrane Review) In: *The Cochrane Library*, Issue 2, 2001 Available at: <http://www.nichd.nih.gov/cochraneneonatal/premji/premji.htm>. [Last accessed on 01/10/03]

Pugin E, Valdes V, Labbok MH, Perez A and Aravena R. (1996) Does prenatal breastfeeding skills group education increase the effectiveness of a comprehensive breastfeeding promotion program? *Journal of Human Lactation*, 12(1): 15-19.

Quan R, Yang C, Rubinstein S, Lewiston NJ, Sunshine P, Stevenson DK, Kerner JA. 1992. Effects of microwave radiation on anti-infective factors in human milk *Pediatrics*, 89(4): 667-669.

Riordan J and Auerbach KG (1998) *Breastfeeding and Human Lactation*, (2nd ed). Boston: Jones and Barlett.

Riordan J. (2005) *Breastfeeding and Human Lactation*, (3rd ed) Boston, Jones and Barlett.

Sale of Infant Formula Ethics Committee. (2002) *Code of ethics on the sale of infant formula in Singapore*. Health Promotion Board, Singapore.

Schafer E, Vogel MK, Viegas S and Hausafus C. (1998) Volunteer peer counselors increase breast-feeding duration among rural low-income women. *Birth*, 25(2): 101.

Schanler RJ, Shulman RJ and Lau C.(1999) Feeding strategies for premature infants: Beneficial outcomes of feeding fortified human Milk versus preterm formula. *Pediatrics*, 103(6): 1150-1157.

Schanler RJ (2001) The use of human milk for premature infants. *Pediatric Clinics of North America*, 207-219.

Scott JA, Landers MCG, Hughes RM and Binns CW (2001) Psychosocial factors associated with the abandonment of breast-feeding prior to hospital discharge. *Journal of Human Lactation*., 17(1): 24-30.

Simpson C, Schanler, RJ and Lau C. (2002) Early introduction of oral feeding in preterm infants. *Pediatrics*, 110(3) 517-522.

Slusser W and Frantz K. (2001) High-technology breastfeeding, *Pediatric Clinics of North America*, 48(2): 505-16.

Spicer K. (2001) What every nurse needs to know about breast pumping: Instructing and supporting mothers of premature infants in NICU. *Neonatal Network*, 20(4): 35-41.

Trachtenberg DE and Golemon TB. (1998) Care of the premature infant: Part I. Monitoring growth and development. *American Family Physician*, 57(9).

Tully MR (2000) Recommendations for handling of mother's own milk. *Journal of Human Lactation*, 16 (2): 149-151.

Uraizee F and Gross SJ. (1989) Improved feeding tolerance and reduced incidence of sepsis in sick very low birthweight (VLBW) infants fed maternal milk. *Pediatric Research*, 25(4): 298A.

Vochem M, Hamprecht K, Jahn G and Speer CP (1998) Transmission of cytomegalovirus to preterm infants through breastmilk. *The Pediatric Infectious Disease Journal*, 17: 53-58.

Wight NE. (2001) Management of common breastfeeding issues. *Pediatric Clinics of North America*, 48(2): 321-344.

Wight NE. (2003) Breastfeeding the borderline (near-term) preterm infant. *Pediatric Annals*, 32(5): 329-336.

Woolridge MW. (1986) The anatomy of infant sucking. *Midwifery*, 2: 164-171.

Worgan R and Jackson H. (2002) *Core curriculum for lactation consultant practice: Preterm Infants*. Massachusetts: Jones and Bartlett.

World Health Organisation. (1992) *Protecting, promoting, and supporting breastfeeding : The special role of maternity services*. A Joint WHO/UNICEF Statement.

World Health Organisation. (1996) *Hepatitis B and breastfeeding*. WHO/UNICEF, Geneva.

World Health Organisation. (1997) *Hypoglycaemia of the newborn: A review of the literature*. WHO, Geneva.

World Health Organisation. (1998a) *Postpartum care of the mother and newborn: Chapter 5: a practical guide*. 1-5.
Available at: <http://www.who.int/reproductive-health> [Last accessed on 20/09/03]

World Health Organisation. (1998b) *Evidence for the ten steps to successful breastfeeding*. WHO, Geneva.

World Health Organisation. (2000) *HIV and infant feeding*.
Available at: http://www.who.int/child-adolescent-health/NUTRITION/HIV_infant.htm
[Last accessed 26/10/02]

World Health Organisation. 2003. *Kangaroo mother care- A Practical Guide*.
Available at: <http://www.who.int/reproductive-health> [Last accessed on 15/05/05]

Breast massage – involves gentle tactile stimulation of mammary and nipple tissue using hand action that roll the knuckles downward over the breast, beginning at the ribs and working towards the areola.

Breast shells – two-piece plastic devices worn over the nipple and areola to revert flat or retracted nipples.

Colostrum – the first milk. It is a yellow, sticky fluid secreted during the first few days postpartum, which provides nutrition and protection against infectious disease. It contains more protein, less sugar and much less fat than mature milk.

Counter-regulation – the process that ensures availability of glucose and other fuels by which the body makes glucose available in the fasted state.

Desaturation – oxygen desaturation are clear indicators of physiologic distress and indicate the need to interrupt or terminate oral feeding.

Foremilk – the first milk obtained at the onset of suckling or expression. Contains less fat than later milk of that feeding.

Frenulum – fold of mucous membrane, midline on the underside of the tongue, which helps to anchor the tongue to the floor of the mouth.

Galactagogue – food or herbs that may increase milk supply. Some may be effective simply by improving the mothers' nutritional status or liquid intake. Others contain components that may be biologically active. Another group of galactagogues are medications that aid in initiating and maintaining adequate milk production. Most exert their pharmacologic effects through interactions with dopamine receptors, resulting in increased prolactin levels and thereby augmenting milk supply.

Galactosemia – a congenital metabolic disorder in which there is an inability to metabolise galactose because of a deficiency of the enzyme galactose-1-phosphate uridylyltransferase.

Glucogenolysis – glycogen breakdown causing the release of glucose.

Gavage feeding – is accomplished by passing a small tube via the nares (nasogastric gavage) or via the mouth (orogastric gavage) directly into the stomach.

Hindmilk – milk obtained later during the nursing period, that is, the end of the feeding. This milk is usually high in fat and probably controls appetite.

Homogenized milk – is milk with the fat particles broken up and dispersed uniformly so the cream will not rise.

Lactogenesis – the onset of copious milk production in the first several days postpartum. After delivery of the placenta, systemic levels of progesterone and oestrogen drop steadily, while prolactin levels remain high.

Lipase – an enzyme that emulsifies milk fat to a finer curd and facilitates digestion.

Lysozyme – a non-specific antimicrobial factor that is thermostable, acid-stable enzyme.

Nasal flaring – refers to enlargement of the opening of the nostrils during breathing. It is often an indication that increased effort is required for breathing and an important sign of respiratory distress.

Phenylketonuria – a rare metabolic disorder in which a liver enzyme is lacking, as a result an essential nutrient, the amino acid phenylalanine is not broken down and accumulates in the blood, interfering with normal brain development.

Premature infant – is an infant whose gestation is less than 37 weeks.

Prolactin – is the principal lactogenic hormone, secreted by the anterior pituitary and is critical to the establishment of lactation, milk macronutrient content and milk production.

Physiologic stability – is the ability to suckle feed and maintain normal body temperature in an open environment. Equally essential is the ability to maintain stable cardiorespiratory function. Cardiorespiratory regulation is immature in pre-term infants, and as a consequence, apnoea (cessation of respiration for >20 seconds), bradycardia (heart rate <100 beats per minute)

and oxygen desaturation dropping to (greater than or equal to) 5% of baseline value may occur.

Retinopathy – Retinopathy of prematurity is a developmental abnormality of the retina and vitreous in pre-term infants, which involves disordered vascularisation, cellular maturation and cellular differentiation. Early detection is important to improve outcome from visual impairment.

Small for gestational age – an infant whose gestation is 37 weeks and more and birth weight is less than 2.270 kg.

Supplementary feed – fluid or food dissolved in fluid that is given to replace a breastfeed.

Supplementation – indicates expressed human milk, fortified human milk, preterm formula or formula, preferably given by gavage, cup or bottle.

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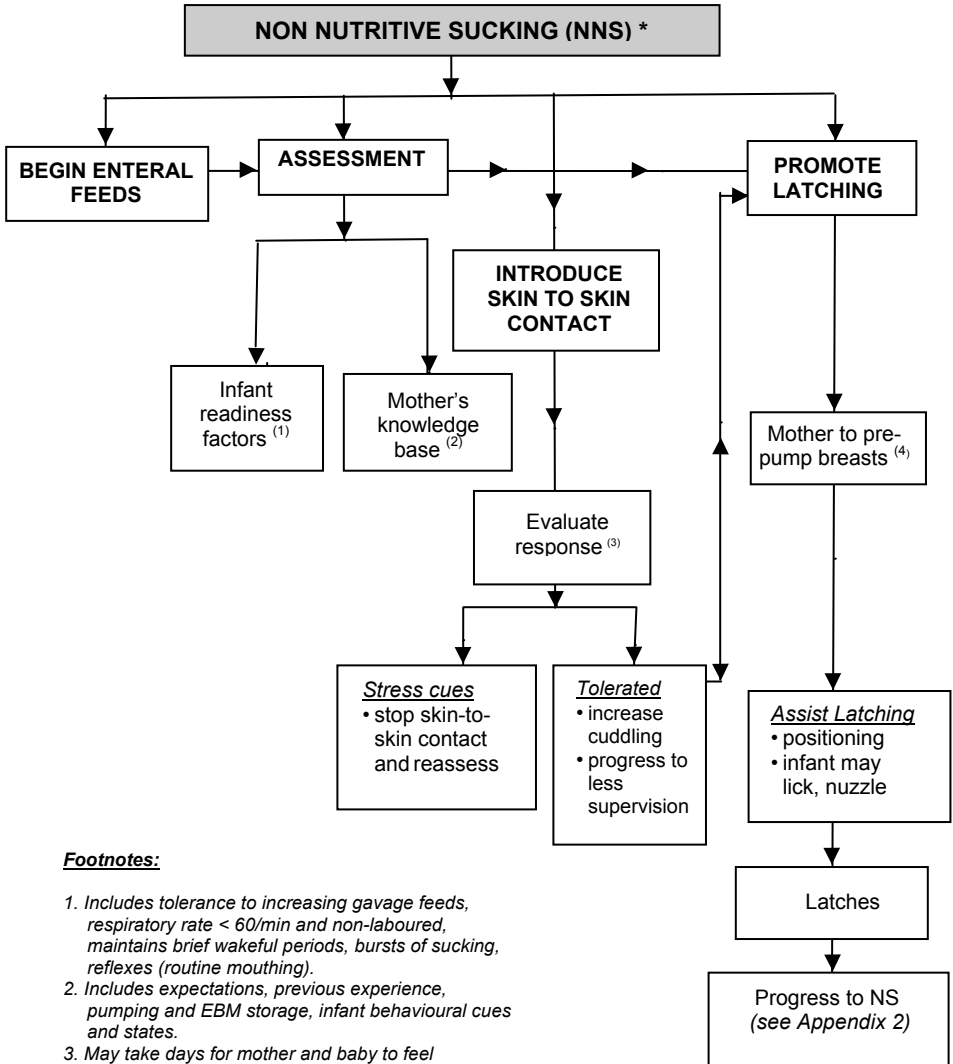
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APPENDIX 1 NON NUTRITIVE SUCKING (NNS)

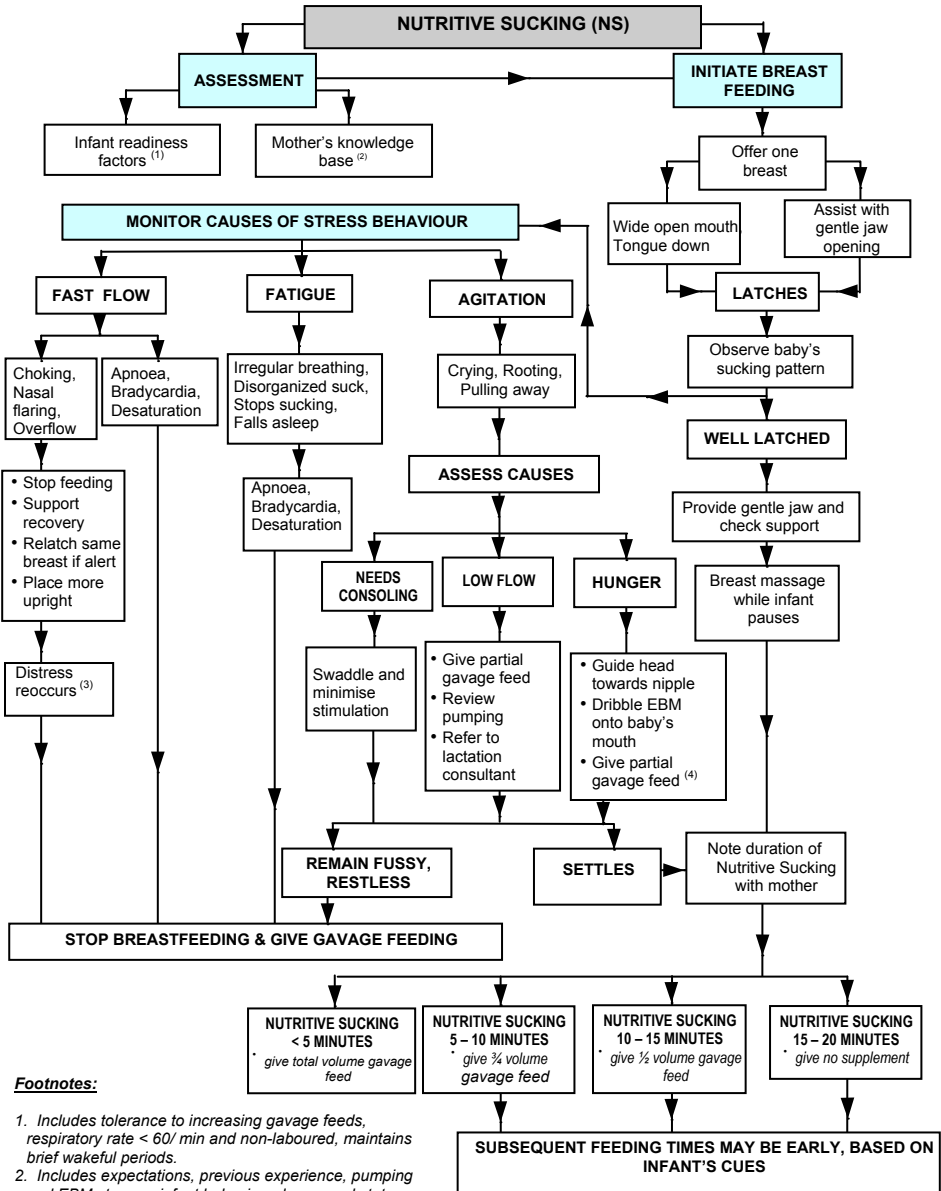


Footnotes:

1. Includes tolerance to increasing gavage feeds, respiratory rate < 60/min and non-laboured, maintains brief wakeful periods, bursts of sucking, reflexes (routine mouthing).
2. Includes expectations, previous experience, pumping and EBM storage, infant behavioural cues and states.
3. May take days for mother and baby to feel comfortable with cuddling.
4. To decrease chance of fast flow and to soften nipples for latching.

(Adapted from BCRCP, 2001)

APPENDIX 2 NUTRITIVE SUCKING (NS)



Footnotes:

1. Includes tolerance to increasing gavage feeds, respiratory rate < 60/ min and non-laboured, maintains brief wakeful periods.
2. Includes expectations, previous experience, pumping and EBM storage, infant behavioural cues and states.
3. Reassess need to partially empty breasts prior to next breast feed.
4. ¼ to ½ volume gavage feed.

(Adapted from BCRC, 2001)

APPENDIX 3 A Guide to Kangaroo Mother Care (KMC) Procedure

1. Identify suitable infant for KMC.
2. Discuss with parents about KMC and seek consent.
3. Ensure privacy and provide a comfortable environment.
4. Ensure mother has a front-opening blouse.
5. Check infant's vital signs before initiating KMC.
6. Undress infant except diaper and bonnet.
7. Place the infant in an upright position against the mother's chest between her breasts.
8. Instruct mother to support infant's buttocks and back with the infant's legs flexed.
9. Ensure infant's head is slightly extended to maintain airway.
10. Cover the infant with mother's blouse or blanket.
11. Monitor infant's vital signs and tolerance during KMC as per unit protocol.
12. Document the duration of KMC.

References and additional information on KMC procedure:

http://kangaroo.javeriana.edu.co/KMCrules_eng.htm

<http://www.med.unc.edu/nursing/manuals/contents/procedure/prc.kangaroo.care.procedure.pdf>

<http://www.who.int/reproductive-health/publications/kmc/kmctext.pdf>

APPENDIX 4 SUPPORT RESOURCES

Hospitals	Contact Numbers
East Shore Hospital	6344 7588
Gleneagles Hospital	6473 7222
KK Women's and Children's Hospital	6293 4044
Mt. Alvernia Hospital	6347 6688
Mt. Elizabeth Hospital	6737 2666
National University Hospital	6779 5555
Singapore General Hospital	6222 3322
Thomson Medical Centre	6256 9494
Raffles Hospital	6311 1111

Support Groups

Breastfeeding Mothers Support Group (S'pore)	6339 3558
Joyful Parenting Services	6488 0286
La Leche League	7000 555 4636

Sale of Breast Pumps

Pharmacies at the above hospitals

Websites

Breastfeeding Mothers Support Group (Singapore)

<http://www.breastfeeding.org.sg/>

La Leche League

<http://lllsg.tripod.com/>

Clinical guide

http://www.moh.gov.sg/cmaweb/attachments/publication/BF_fullterm_internet_version.pdf

SIFEC

<http://www.sgdi.gov.sg/>

Association for Breastfeeding Advocacy Singapore [ABAS]

<http://www.abas.org.sg>

APPENDIX 5 SELF ASSESSMENT

- Q1** A primigravida mother delivered a 30-week baby who is in the Neonatal ICU. She had decided to provide EBM to her baby. Which is the most important help the nurse should offer this mother?
- (a) Give her moral support and counselling.
 - (b) Share her concern and ask her not to be anxious.
 - (c) Tell her to EBM every 3 hourly.
 - (d) Offer her clear instructions and practical suggestions on the technique of EBM, storage and the usage of breast pump.
- Q2** General guidelines should be given to mother when storing EBM, which of the following is an incorrect advice:
- (a) Use insulated container with refreezable ice-pack during transportation of EBM.
 - (b) Thaw frozen milk by standing in a bowl of warm water.
 - (c) Store remaining, unfinished milk in the refrigerator at 4 degrees Celsius for 48 hours.
 - (d) Shake gently after thawing to remix the creamy portion which separates during storage.
- Q3** In the management of low milk supply, the following is suggested except:
- (a) Review mother's pumping schedule.
 - (b) Ensure adequate rest by sleeping through the night.
 - (c) Provide counselling and emotional support.
 - (d) Use galactogogues if needed.
- Q4** Causes of insufficient milk supply includes the following except:
- (a) Infrequent pumping.
 - (b) Hypothyroidism.
 - (c) Maternal smoking.
 - (d) Caesarean delivery.

- Q5** How often is the mother encouraged to express breast milk?
- (a) Whenever mother feels like pumping for the first 2 days.
 - (b) 4-6 times during the day.
 - (c) 6-8 times inclusive of once or twice at night in 24 hours.
 - (d) When the breasts feel full.
- Q6** The KMC has all of the following outcomes on the infant's physiology except:
- (a) Higher infant metabolism.
 - (b) Enhance bonding.
 - (c) Stabilize infant temperature.
 - (d) Maintain infant oxygen saturation.
- Q7** Why is the high quality electric pump with double pumping kit essential for use by mothers with preterm infants?
- (a) So that both breasts are emptied simultaneously.
 - (b) Greater milk yield.
 - (c) Higher prolactin level.
 - (d) All of the above.
- Q8** When refrigerated EBM separates into two layers, it shows that:
- (a) The expressed milk is spoilt.
 - (b) The milk has turned sour.
 - (c) The fat is separated.
 - (d) The milk is of poor quality.
- Q9** All of the following are true regarding cytomegalovirus (CMV) transmission in breastmilk **except**:
- (a) The risk of CMV infection in breastfed premature infant was highest when mother shed viable virus in their breastmilk.
 - (b) Observational studies have reported a 10% - 59% transmission rate of CMV to preterm infants receiving CMV-positive breast milk.
 - (c) No transmission of the human cytomegalovirus has been linked with consumption of frozen CMV-positive breastmilk.
 - (d) Pasteurization of breast milk reduces the risk of CMV transmission.

- Q10** Which of the following statements regarding non nutritive sucking (NNS) is not true?
- (a) NNS refers to sucking activity when no fluid or nutrition is delivered to the infant.
 - (b) NNS is used for the transition from gavage to breast/bottle feeding in preterm infants.
 - (c) NNS facilitates maturation of the sucking reflex and improves digestion.
 - (d) NNS is recommended only when the infant is able to tolerate gavage feeds.
- Q11** When preparing the infant for NNS, the nurse should perform the following except:
- (a) Evaluate infant's readiness factors and mother's knowledge base.
 - (b) Introduce skin-to-skin contact.
 - (c) Advise mother to pre-pump breast.
 - (d) Assist infant to achieve alert state by waking the infant up.
- Q12** If a pre-term infant demonstrates stress behaviour during nutritive sucking at the breast, the nurse should:
- (a) Provide partial gavage feed.
 - (b) Assess the cause of the stress behaviour and provide the appropriate interventions.
 - (c) Console the infant and reassure the mother.
 - (d) Refer to the lactation consultant.
- Q13** A preterm infant has inadequate nutritive sucking at the breast for less than 5 to 10 minutes. The nurse should provide:
- (a) Total volume of the gavage feed.
 - (b) $\frac{3}{4}$ volume of the gavage feed.
 - (c) $\frac{1}{2}$ volume of the gavage feed.
 - (d) $\frac{1}{4}$ volume of the gavage feed.
- Q14** What are the components in human milk that will help to reduce nosocomial infections and NEC in preterm infants?
- (a) Vitamin C.
 - (b) Vitamin A.
 - (c) Immunological protective factors.
 - (d) All of the above.

Q15 Which of the following is true about milk storage?

	<u>Location and temperature</u>	<u>Time</u>
(a)	Milk in a cooler with ice pack (15°C)	48 hr
(b)	Fresh milk in refrigerator (4°C)	48 hr
(c)	Previously thawed milk in refrigerator (4°C)	36 hr
(d)	Frozen milk in a freezer with separate door from refrigerator	12 months

Q16 The pre-term infant is ready for discharge when the infant is:

- (a) Medically fit and physiologically stable.
- (b) At least 35 weeks (corrected gestational age).
- (c) On full oral feeds and approximately 2 kg in weight
- (d) All of the above.

Answer

	<u>Answer</u>	<u>Page</u>		<u>Answer</u>	<u>Page</u>
Q1	d	17	Q9	c	14
Q2	c	22	Q10	d	32
Q3	b	23	Q11	d	62
Q4	d	24	Q12	b	63
Q5	c	21	Q13	b	63
Q6	a	33	Q14	c	3
Q7	d	20	Q15	b	22
Q8	c	22	Q16	d	43

