

# Breastfeeding the Late Preterm Infant

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## ABSTRACT

Late preterm infants comprise the fastest growing segment of babies born prematurely. They arrive with disadvantages relative to feeding skills, stamina, and risk for conditions such as hypoglycemia, hyperbilirubinemia, and slow weight gain. Breastfeeding these babies can be difficult and frustrating. Individualized feeding plans include special considerations to compensate for immature feeding skills and inadequate breast stimulation. Breastfeeding management guidelines are described that operate within the late preterm infant's special vulnerabilities.

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The rate of premature birth in the United States increased almost 35% between 1981 and 2005, rising from 9.4 to 12.8% of all births, while Canadian premature birth rates are lower at 7.6% of babies born prematurely in 2000, compared with 6.6% in 1991 (Health Canada, 2003). The fastest growing portion of preterm births in the United States is that of infants born between 34 and 36 6/7 weeks who represented 72% of the preterm births in 2005 (Hamilton, Martin, & Ventura, 2007). This worrisome trend has resulted in health agencies and professional associations such as Association of Women's Health Obstetric and Neonatal Nurses creating new initiatives to improve provider and consumer awareness of this vulnerable population and develop resources for clinicians to appropriately care for these infants (Askin, Bakewell-Sachs, Medoff-Cooper, Rosenberg, & Santa-Donato, 2008). In addition, between 1992 and 2002, the most common gestational age of singleton infants born in the United States dropped an entire week, from 40 to 39 weeks (Davidoff et al., 2006).

In July 2005, a National Institutes of Health panel recommended that this group of infants be referred to as late preterm rather than near term to better convey their greater vulnerabilities and need for closer monitoring and follow-up. The panel's opinion was that "near term" can mislead parents and clinicians into thinking that these infants were almost term and could be treated similar to term infants (Raju, Higgins, Stark, & Leveno, 2006). In fact, late preterm infants are at an increased risk for airway instability, apnea, bradycardia, excessive sleepiness, excessive weight loss, dehydration, feeding difficulties, weak sucking, jaundice, hypo-

glycemia, hypothermia, immature self regulation, respiratory distress, sepsis, prolonged artificial milk supplementation, hospital readmission, and breastfeeding failure during the neonatal period (Adamkin, 2006; Engle, Tomashek, Wallman, & the Committee on Fetus and Newborn, 2007). The lower the gestational age, the higher the risk of these problems. Even though some late preterm infants may look full term, they are physiologically, metabolically, and neurologically immature and have limited compensatory mechanisms to adjust to the extrauterine environment.

Late preterm infants are more likely to be readmitted to the hospital, especially for jaundice and infection, with breastfed late preterm infants 2.2 times more likely to be readmitted compared with those not breastfed (Tomashek et al., 2006). Also of note is that infants born between 37 and 39 weeks experience a two- to fourfold risk of complications such as respiratory distress, NICU admission, sepsis, or hospitalization for more than 5 days (Tita, Mercer, & Ramin, 2008). They too may need extra vigilance compared with an infant of 39 to 40 weeks gestation.

Human milk is very important to infants born preterm as they have a lower antioxidant capacity. This may provide a partial explanation of why late preterm infants are so vulnerable to diseases and conditions associated with oxidative stress such as necrotizing enterocolitis, chronic lung disease, retinopathy of prematurity, periventricular leukomalacia, and intraventricular hemorrhage. Breastmilk is much higher in antioxidant capacity than infant formula and may help neutralize oxidative

stress on young infants (Ezaki, Ito, Suzuki, & Tamura, 2008).

Late preterm infants are at a disadvantage in terms of feeding skills. Born with low energy stores (both subcutaneous and brown fat) and high energy demands, the poor feeding skills of developmentally immature infants are challenged to meet the hydration and nutritional needs of this population. Sleepy infants with few and short awake periods offer limited feeding opportunities. Tiring quickly when feeding limits the length and number of nutritive sucking bursts and reduces the intake of colostrum or milk. Early fatigue and lack of sustained sucking may give a false signal of satiety rather than indicating inadequate intake, leading mothers and clinicians to erroneously conclude that the infant ingested a sufficient volume of milk. Late preterm infants have a weak suck and low tone that may diminish milk volume per suck. Uncoordinated oral movements may be mistaken for nutritive feedings, placing this population of infants at risk for dehydration, insufficient caloric intake, and high bilirubin levels. Late preterm infants are easily overstimulated and may shut down before consuming adequate amounts of colostrum or milk. If treated like a normal term newborn they are at an increased risk for inadequate nourishment. Late preterm infants may go through the motions of feeding but may transfer little if any milk for their efforts.

The mothers of late preterm infants may be at increased risk for delayed lactogenesis II because of factors that contributed to the preterm birth. Mothers may be overweight or obese, experienced a cesarean delivery, have pregnancy induced hypertension, diabetes, or been treated for preterm labor, all of which are associated with the delayed onset of copious milk production. Approximately 24.5% of women 20 to 44 years of age are overweight (BMI 25.0-29.9 kg/m<sup>2</sup>) and 23.0% are obese (BMI greater than or equal to 30.0 kg/m<sup>2</sup>) (Vahratian, 2008). While obesity itself does not cause preterm birth, it increases the maternal medical problems that often lead to preterm deliveries such as diabetes and hypertension. Chapman and Perez-Escamilla (1999a) found that obese women were more likely to have low milk transfer at 60 hours postpartum, an indicator for delayed lactogenesis. Rasmussen and Kjolhede (2004) found that women who were overweight or obese (BMI greater than 26 kg/m<sup>2</sup>) before conception had a lower prolactin response to suckling than normal-weight women at 48 hours. These findings are of note because during the time just before and after lactogenesis II, the prolactin

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**They may resemble full term babies, but late preterm infants are physiologically, metabolically, and neurologically immature with limited compensatory mechanisms for adjusting to extrauterine life.**

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response to suckling is more important for milk production than it is later in lactation.

The cesarean birth rate climbed to 30.3% of births in 2005 (Martin et al., 2007) with the increase in the preterm birth rate, especially for late preterm birth, occurring primarily among cesarean section deliveries (Bettegowda et al. 2008). Several studies have demonstrated delayed lactogenesis II in mothers experiencing a cesarean delivery (Chapman & Perez-Escamilla, 1999b; Dewey, Nommsen-Rivers, Heinig, & Cohen, 2003; Hildebrandt, 1999; Vestermark, Hogdall, Birch, Plenov, & Toftager-Larsen, 1991). Furthermore, women who delivered by cesarean section lacked a significant rise in prolactin levels at 20 to 30 minutes after the onset of breastfeeding (Nissen et al., 1996), further disrupting the balance of hormones that promote lactogenesis II. Preterm birth itself often compromises the initiation of lactation by delaying the onset of copious milk production (Cregan, De Mello, Kershaw, McDougall, & Hartmann, 2002).

The onset of lactogenesis II in Type I diabetic women has been shown to be delayed between 15 and 28 hours (Arthur, Smith, & Hartmann, 1989; Neubauer et al., 1993). Prolactin concentrations are lower in diabetic women during the early days postpartum, the time during which hormonal control of the onset of lactation is sensitive to aberrations in the secretion of prolactin, the principle lactogenic hormone (Ostrom & Ferris, 1993). Bromiker et al. (2006) noted poorer sucking patterns among infants of insulin-managed diabetic mothers which would add another dimension to feeding difficulties if the infant was both late preterm and had a diabetic mother. These maternal conditions present a prolonged colostrum phase to an infant with immature feeding skills and serve to limit the amount of milk available to the infant during the early days.

### Breastfeeding Management Within Infant Vulnerabilities

The organization and selection of breastfeeding interventions for late preterm infants is predicated by their vulnerabilities. Breastfeeding management options for this population are often extrapolated from those used with either full term

**Table 1: Evidence-Based Hospital Breastfeeding Protocols for Late Preterm Infants**

California Perinatal Quality Care Collaborative. *Care and management of the late preterm infant toolkit: Nutrition*. Retrieved July 3, 2008, from <http://www.cpqcc.org/quality.improvement/qi.toolkits/care.and.management.of.the.late.preterm.infant.toolkit>

The Academy of Breastfeeding Medicine. *Protocol #10: Breastfeeding the near-term infant (35-37 weeks gestation)*. Retrieved May 4, 2008, from <http://www.bfmed.org/ace-files/protocol/near.term.pdf>

infants or with infants less than 34 weeks of gestation. Evidence-based protocols for breastfeeding the late preterm infant are included in Table 1 for help with working with this population. Breastfeeding interventions are designed to prevent adverse outcomes, establish the mother's milk supply, and assure adequate infant intake.

**Hypothermia and Hypoglycemia**

Immediately following birth if the infant and mother are stable, place infants skin-to-skin on the mother's chest while being dried, covered with warm blankets, and having a cap placed on their head. Extended skin-to-skin contact keeps the infant warm, prevents crying, and allows for frequent feedings, all of which help prevent hypoglycemia (Bergman, Linley, & Fawcus, 2004). Infants interact more with their mothers, are more likely to be breastfed and to breastfeed longer, and show better cardio-respiratory stability if they have early skin-to-skin contact (Moore, Anderson, & Bergman, 2003). Christensson et al. (1992) noted a 10 mg/dl drop in blood glucose levels when full term infants were removed from their mother and placed in a bassinet. Late preterm infants may derive the same benefit from remaining in skin-to-skin care. This also facilitates the placement of infants to the breast for their first feeding within an hour or so of birth. If the mother experienced a cesarean delivery, her infant is best recovered with her and assisted to breastfeed in the recovery room.

**Respiratory Instability**

Careful feeding positioning is necessary to avoid apnea, bradycardia, or desaturation, especially for the younger infants with decreased muscle tone. They are more prone to positional apnea due to airway obstruction so that feeding positions that cause excessive flexion of the neck or trunk are best avoided. The traditional cradle hold is one of



**Figure 1.** Clutch positioning. Mother's hand encircles the infant's head providing support but not flexing the head to the breast. Copyright Medela, INC. Used with permission.

these, as infants may experience extreme flexion of the trunk and neck, impeding full rib cage expansion and contributing to collapse of the airway. Clutch (Figure 1) or cross cradle (Figure 2) are positions of choice (Meier, Furman, & Degenhardt, 2007). Mothers are instructed not to flex the head when using either of these positions. When utilizing the clutch positioning, care should be taken to assure that the breast does not rest on the baby's



**Figure 2.** Cross cradle positioning allows the mother to support the infant's trunk and gives her complete control over flexion and extension of the head. Copyright Medela, INC. Used with permission.

chest, further impeding breathing and rib cage expansion.

## Hypotonia and Immature Feeding Skills

Some infants may be able to effectively latch, suck, and swallow colostrum, especially with jaw support. Others will tire quickly, be unable to sustain nutritive sucking, or lack the strength to draw the nipple/areola into the mouth and generate the – 60 mm Hg (Geddes, Kent, Mitoulas, & Hartmann, 2008) of pressure necessary to secure the nipple in place between sucking bursts. Late preterm infants demonstrate a wide range of variations in sucking patterns, sucking intensity, and the frequency and duration of pauses between sucking bursts. Nyqvist, Farnstrand, Eeg-Olofsson, and Ewald (2001) used surface electromyography in a study of sucking patterns in 26 infants aged 32 to 37 weeks. The time actually spent engaged in sucking ranged between 10% and 60% of a feeding while mouthing movements other than sucking ranged from 2% to 35% of the feeding, and pauses ranged from 12% to 67% of a feeding.

Infants may experience hypotonia from the maternal use of labor medications such as nalbuphine (Nubain). The Food and Drug Administration (FDA) recommends that newborns be monitored for respiratory depression, apnea, bradycardia, and arrhythmias if Nubain has been used (FDA, 2005). Fetal exposure during the third trimester to selective serotonin reuptake inhibitors has also been reported to cause feeding difficulties (Nordeng & Spigset, 2005). Mothers may find that using the Dancer hand position (Figure 3) helps stabilize the jaw so the infant does not keep coming off the nipple or does not bite or clench the jaws to keep from sliding off the breast (Danner & Cerutti, 1984). The Dancer hand position is formed when the mother slides the hand supporting her breast forward, so the breast is resting on the heel of the hand. A U-shape is formed with the thumb and index finger on either side of the infant's cheeks, cradling the infant's chin in the bottom of the U. The thumb and index finger rest on the infant's cheeks and are available to gently press in on the cheeks if the infant needs more support. If the areola is engorged, reverse pressure softening can be utilized to displace fluid in the areola for an easier latch (Cotterman, 2004). If flat nipples are compromising latch, consider using a modified syringe to evert the nipple (Kesaree, Banapurmath, Banapurmath, & Shamanur, 1993). A 10 ml syringe is modified by cutting  $\frac{1}{4}$  in. above where the needle attaches, re-

moving the plunger and inserting into the cut end. The smooth end is placed over the nipple, and the mother pulls back gently on the plunger for 30 seconds before a feeding.

Commercial devices can also be used to evert flat nipples (Evert-It Nipple Enhancer by Maternal Concepts and the Latch Assist by Lansinoh Laboratories). Alternate massage may be helpful to sustain sucking and increase the amount of colostrum or milk transferred at a feeding. The mother massages and compresses the breast each time the infant pauses between sucking bursts. This helps improve the pressure gradient between the breast and the mouth, reducing the effort necessary to withdraw milk. She massages all quadrants of each breast to prevent milk stasis and a downregulation of milk production from a lack of adequate drainage.

A nipple shield may be considered to compensate for weak sucking, as preterm infants often repeatedly lose contact with the nipple, slipping off the breast and necessitating many attempts at relatching. Select the size (16, 20, or 24 mm) that best fits the baby's mouth (a 24 mm size may be too big for the younger infants). The mother moistens the shield with warm water and turns it almost inside out when applying it to the nipple. This helps the shield stay in place better and places the nipple as far into the nipple tunnel as possible. The mother can hand express some colostrum/milk into the shield's nipple tunnel to make milk immediately available to the infant and responsive to any amount of sucking. Once the nipple has been drawn into the shield, a vacuum in the semirigid teat assures that the nipple stays elongated and lowers the workload on the infant of having to constantly draw the nipple/areola back into the mouth.

The mother can also place a few drops of colostrum or milk on the tip of the shield to encourage latch on. The latch is then checked to make sure that the lips and gums completely cover the shield tunnel and the infant is not just gumming the tip of the shield. Infants are put to breast about 10 times each 24 hours when demonstrating a light sleep state or feeding cues. Use of the thin silicone shields has not resulted in compromised prolactin levels (Chertok, Schneider, & Blackburn, 2006).

## Supplementation

If the infant cannot obtain adequate colostrum or milk directly from the breast with the use of frequent cue-based feeds, alternate massage, or with the shield in place, supplementation may be required.

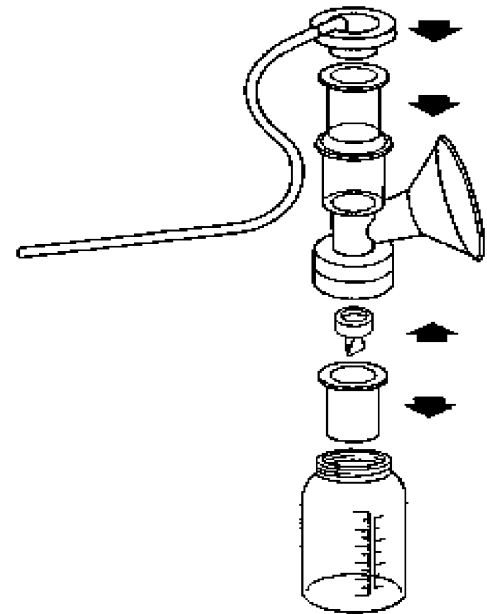


**Figure 3.** Dancer hand position supports the infant's jaw, decreasing the workload of maintaining a proper latch while helping prevent the infant from slipping off of the breast. Used with permission, B.Wilson-Clay, K. Hoover, *The Breastfeeding Atlas*, 3rd ed.

The best supplement is expressed colostrum/milk or banked human milk if available. Feeding volumes of 5 to 10 ml every 2 to 3 hours on the first day, with 10 to 20 ml on day 2, and 20 to 30 ml on day 3 are suggested (Stellwagen, Hubbard, & Wolf, 2007). Mothers can hand express colostrum into a spoon and spoon feed this to the infant (Figure 4) (Hoover, 1998). If a pump is used to express colostrum, the small amounts may cling to the sides of the collection container leaving little for actual use. Pumping into a small container such as an Ameda diaphragm that has been placed between the valve and the collection bottle of either an Ameda or Medela breast pump may yield a greater quantity of usable colostrum (Figure 5). After that, volumes will be dependant on metabolic requirements and feed-



**Figure 4.** Hand expressing colostrum into a spoon as a supplement for spoon feeding to the infant. Used with permission, B.Wilson-Clay, K. Hoover, *The Breastfeeding Atlas*, 3rd ed.



**Figure 5.** Ameda diaphragm placed between valve and collection bottle to capture small amounts of colostrum. Copyright Ameda. Used with permission.

ing tolerances. If an infant cannot gain appropriate weight with adequate volumes of breast milk, more calorie dense hindmilk can be used as a supplement, the breast milk can be fortified, or infant formula could be added temporarily until the infant is fully established at breast. Use of a hydrolyzed formula will reduce the risk of sensitizing a susceptible infant to allergies (Greer, Sicherer, & Burks, 2008) or diabetes, and may help lower bilirubin levels (Gourley, Li, Kreamer, & Kosorok, 2005).

Supplementation is best done at the breast if at all possible. A 5 French feeding tube can be attached to a 10 ml syringe for supplementation at the breast. The tubing can be taped to the breast, placed under or over a shield, or held in place by a helper. Similar devices can be created from a length of butterfly tubing (with the needle removed) attached to a 20 or 30 ml syringe (Edgehouse & Radzysinski, 1990). Small boluses can be used if needed to help the baby initiate and sustain sucking, as flow regulates suck. Commercial supplementer systems can be considered for longer-term supplementation. The flow rate can be adjusted with any of these devices to either augment the flow or reduce the flow to avoid overwhelming an infant with low endurance.

If the infant is holding his breath, looking distressed, sputtering, or coughing then the flow of milk needs

to be slowed such that a comfortable ratio of sucking to swallowing is seen and the infant inhibits breathing only when swallowing (Wolf & Glass, 2008). Cup and finger feeding are other options. Cup feeding allows participation of the masseter and temporalis muscles, similar to the functioning of these muscles during breastfeeding (Gomes, Trezza, Murade, & Padovani, 2006). Perioral muscle function differs between bottle feeding and breastfeeding, with a weakening of masseter muscle activity in bottle-fed infants (Inoue, Sakashita, & Kamegai, 1995). There can be significant differences between bottle-feeding systems in terms of swallowing and the stability of the suck-swallow-breathe cycle (Goldfield, Richardson, Lee, & Margetts, 2006). Random, frequent, and uncoordinated swallowing seen with some bottle-feeding systems can contribute to oxygen desaturation, poor intake, and a delay in breastfeeding skill acquisition. If a bottle is used, paced feedings are important to avoid fatigue and desaturation in the baby.

Supplementation may need to continue following discharge. This can be included in a discharge feeding plan. Even when adequate breastmilk is available, infants with immature breastfeeding skills may not be able to consume all of what they require until their actual due date or beyond (Hurst, Meier, & Engstrom, 1999).

## Hyperbilirubinemia

Late preterm infants experience a combination of factors that put them at a 7 to 13-fold increased risk for rehospitalization for jaundice (Maisels & Kring, 1998) including slower meconium passage, decreased activity of the bilirubin-conjugating enzyme uridine diphosphate glucuronyl transferase, and low milk intake. Kernicterus is also seen more frequently in late preterm infants (Bhutani & Johnson, 2006). Bilirubin peak levels generally occur around 2 to 3 days in term infants; however, peak bilirubin levels in late preterm infants typically occurs around 5 to 7 days of life. Four preventive goals can help reduce jaundice-related complications (Stellwagen, Hubbard, & Wolf, 2007).

### Optimize Milk Intake

Optimize milk intake by assuring that the infant has 10 or more feedings each 24 hours and verifying that the infant is swallowing colostrum/milk at these feedings. Frequent feedings do not assure adequate intake unless the infant is actually

swallowing during most of the feeding. Infants should be checked for a deep latch. Mothers can add alternate massage to increase milk transfer, and use a nipple shield if weak sucking pressures prevent good intake.

### Promote Rapid Meconium Clearance and Increase Stool Volume

Rapid meconium clearance with increased stool volume will occur as an outcome of frequent colostrum feeds. If the infant cannot obtain colostrum directly from the breast, the mother can hand express colostrum into a spoon and spoon feed volumes of 5 to 10 ml every 2 to 3 hours on the first day, 10 to 20 ml on day 2, and 20 to 30 ml on day 3 (Stellwagen, Hubbard, & Wolf, 2007).

### Prevent Excessive Weight Loss

Bertini, Dani, Tronchin, and Rubaltelli (2001) found that newborns with significant hyperbilirubinemia experienced a greater weight loss after birth compared with the overall studied population, and infants given mixed feedings lost more weight than breastfed and formula-fed newborns. Significant hyperbilirubinemia was also strongly associated with delivery by vacuum extractor, some perinatal complications (cephalohematoma, positive Coombs' test, and blood group systems of A, AB, B, and O [ABO] incompatibility) and Asian origin. It is important to assure that feedings are not missed or skipped due to the presence of visitors or excessive interruptions. One feeding per shift can be observed by a nurse or lactation consultant to document that swallowing is taking place. A mother must be able to determine when her infant is swallowing milk to assure that excessive weight loss does not occur postdischarge. Up and down jaw movements are not indicative of swallowing and can be often mistaken for nutritive sucking. Pre- and postfeed weights can be performed if there is significant doubt as to the infant's intake at the breast.

The measurement of total serum bilirubin and transcutaneous bilirubin levels for newborns before discharge and the use of a nomogram is becoming a common practice in many hospitals. Use of a bilirubin nomogram is recommended by the American Academy of Pediatrics (Subcommittee on Hyperbilirubinemia, American Academy of Pediatrics, 2004) as a predictor of subsequent hyperbilirubinemia. These data are useful for detecting worrisome trends, for identifying infants who need additional evaluation, and for planning

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**Major barriers to breastfeeding for late preterm infants include inefficient sucking patterns, reduced alertness and stamina, and inability to self-regulate.**

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appropriate follow-up care for jaundiced newborns. Maisels and Kring (2006) have constructed bilirubin nomograms for infants 35 to 37 6/7 weeks and 38 to 39 weeks. Mothers whose babies are at very high risk for jaundice can be discharged with a hand held bilirubin meter for closer monitoring over the first week of life.

### Immature Self Regulation

More than one third of the brain volume at term is acquired during the last 6 to 8 weeks of gestation, leaving late preterm infants at a disadvantage in responding to stimuli and regulating internal processes. Major influences on the initial pattern and ultimate duration of breastfeeding include the ability of the infant to suck efficiently, demonstrate alertness and stamina and ability to self-regulate and respond to maternal soothing behaviors (Lothian, 1995). The immature brainstem adversely impacts upper airway and lung volume control, laryngeal reflexes, and the chemical control of breathing and sleep mechanisms, with 10% of these infants experiencing significant apnea of prematurity (Darnall, Ariagno, & Kinney, 2006). With fewer sulci and gyri in the brain and less myelin, late preterm infants may have difficulty with self-regulation as the autonomic nervous system is usually immature. This means that they may respond in a negative manner to stressful stimuli with tachycardia, bradycardia, abnormal breathing, skin mottling, frequent startling, and spitting up.

Karl (2004) described behavioral breastfeeding difficulties on a continuum, from underaroused sleepy babies through the quiet alert state (optimal for feeding) to the overaroused fussy reluctant nurse. For infants unable to manage their state well enough to latch, skin-to-skin care can be initiated to modulate infant state for the underaroused, overaroused, or shut down infant. Parents need to be aware that stroking, massaging, rocking, talking, bright lights, loud noise, and being handed off to multiple visitors may cause the infant to shut down. Infants experiencing state overload may appear to be sleeping but may be shut down in an effort to protect themselves from excessive stimulation that raised their arousal levels beyond what they can manage.

Shut down infants demonstrate tense muscle tone, furrowed eyebrows, tightly shut eyes, and a pale or

flushed color. More stimulation to these infants further exacerbates the problem. Parents need to become knowledgeable regarding how best to help their baby achieve a latchable state. Engaging in only one activity at a time reduces multiple stimuli and since alert periods are scarce, mothers need to place the infant to the breast at these times. Parents can limit visitors during the first 2 weeks while hospital staff work to minimize the dozens of interruptions that mothers experience each day during the hospital stay (Morrison, Ludington-Hoe, & Anderson, 2006).

### Initiating and Maintaining the Maternal Milk Supply

Initiation and protection of the maternal milk supply starts in the hospital. If the infant is unable to transfer colostrum then hand expression or pumping is best started within 6 hours of delivery (Hill, Aldag, & Chatterton, 2001). Anecdotal reports describe some mothers as having a considerable colostrum bolus available by pump immediately following delivery. Should the infant be unable to latch or transfer colostrum at that time, it may be beneficial to have the mother pump her breasts immediately following the infant's initial attempts at feeding.

Mothers will require a high-quality hospital grade breast pump and will need to express milk after each breastfeeding attempt and/or 8 to 10 times each 24 hours for the first 2 weeks or until the infant is established at the breast. The nurse or lactation consultant can help the mother select a properly fitted flange or breastshield. As nipples swell during pumping, it is important that the nipple be able to move freely once it is drawn into the shield's tunnel (Wilson-Clay & Hoover, 2002). If the nipple becomes strangulated in the shield's tunnel soreness, reduced milk flow, and low milk supply can result. Standard pump kits provide flanges whose nipple tunnel opening is 24 to 25 mm, but many mothers benefit from a larger opening of 27 to 30 mm which avoids nipple pain and results in more effective pumping (Meier, Motykowski, & Zuleger, 2004).

Following discharge, mothers can use cluster or power pumping several times a day to increase milk output if needed. This involves pumping for about 10 minutes or so or until as much milk as possible has been released from the first let down, then pumping again about 20 minutes later to "trick" the breasts into another "first" let down. The first let down can produce almost half of the total volume of milk in the breast (Ramsay et al., 2006). It is necessary to

monitor milk production very carefully during the first 7 days following delivery as there is a high potential for insufficient milk (Hill, Aldag, Chatterton, & Zinaman, 2005). Mothers who are exclusively or predominantly pumping will target an output of 3500 ml/week (500 ml/day) by the end of the second week to achieve an optimal supply for sustained lactation (Hill, Aldag, & Chatterton, 1999).

## Conclusion

The birth of a late preterm infant can be emotionally grueling on new parents, especially when a deceptively healthy-looking infant is subjected to high-risk interventions. Breastfeeding success will improve if clinicians utilize an evidence-based protocol (Table 1). To assure consistent and effective care, the nurse, the lactation consultant, and the mother can mutually construct written feeding plans for use in the hospital and following discharge (Wight, 2003). With twins or higher order multiples, different feeding plans are frequently utilized for each infant. Mothers are advised to make an appointment with the infant's primary care provider

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### Late preterm infants can be breastfed very successfully, and with good planning and follow-up care, they will receive the full benefits of their mother's milk.

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within 2 days of discharge if leaving the hospital within 72 hours. This provides an early check to assure that the infant has not lost an excessive amount of weight and that bilirubin levels have not reached a concerning level. Another visit may be warranted at 5 to 7 days of age when bilirubin levels are likely to peak. Parents can be cautioned about the use of baby slings for the late preterm infant. While slings are a wonderful mechanism for keeping an infant close for breastfeeding and soothing needs, the flexed position in a sling may not be appropriate until the infant is a little older. Mothers will need to use slings that can accommodate the infant in a position that does not cause excessive flexion. Mothers may find that infant wraps also work well to keep their infants in a more upright position that avoids extreme flexion. Mothers require written information on the care of the late preterm infant as well as the name and contact information for a lactation consultant with the IBCLC credential for breastfeeding follow-up (Table 2).

Breastfeeding within the altered capabilities of the late preterm infant is challenging for parents and clinicians. Additional time and specialty care assure a rewarding feeding experience. Late preterm infants can be breastfed successfully, and with good planning and follow-up care, they will receive the full benefits of their mothers' milk.

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#### Table 2: Resource for Parents of Late Preterm Infants

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Contemporary Pediatrics. *Guide for parents going home with your late preterm infant*. Retrieved May 4, 2008, from <http://www.modernmedicine.com/modernmedicine/Parent+Guides/Parent-Guide-Going-home-with-your-late-preterm-inf/ArticleStandard/Article/detail/473739?contextCategoryId=6465>

From AWHONN: *Late preterm (near-term) infant: What parents need to know*. Retrieved May 4, 2008, from <http://www.awhonn.org/awhonn/content.do?name=02.PracticeResources/2C3.Focus.NearTermInfant.htm>

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