POST-DISCHARGE BREASTFEEDING PATTERNS
OF MOTHERS AND THEIR PRETERM INFANTS
BORN AT 30 TO 34 WEEKS GESTATION

By

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Abstract

Little is known about how preterm infants make the transition from breastfeeding and bottle feeding to exclusive breastfeeding in the weeks following hospital discharge. The thesis examined breastfeeding patterns for 66 infants between 30 and 35 weeks gestation over a four-week period after hospital discharge. The relationships among breastmilk feeding, feeding mode, maternal confidence and competence were also examined. Daily feeding diaries were completed by 53 mothers. From a detailed examination of the feeding diaries, the proportion of breastmilk feeds, and feeding mode (feeds directly at breast) were described. The infants received a high proportion of breastmilk feeds with 60% receiving breastmilk exclusively for the first week, and 56% receiving breastmilk exclusively for the four-week period. The number of feeds directly at breast increased steadily over the four-week period. Twins received significantly \( F[1, 58] = 2.58, p = .055 \) fewer breastmilk feeds than singletons, and were fed directly at breast significantly \( F[1, 61] = 13.84, p = .0004 \) less often. In week one, mothers giving breastmilk feeds exclusively had higher levels of competence than those giving breastmilk and artificial milk \( F[1, 48] = 5.71, p = .02 \). Mothers who fed directly at breast more than half of the time were significantly more confident \( F[1, 49] = 5.32, p = .03 \) and competent \( F[1, 49] = 4.24, p = .05 \) in week one than those who fed directly at breast less than half of the time. Maternal confidence \( t[50] = -5.13, p < .01 \) and competence \( t[50] = -4.25, p < .01 \) increased significantly from week one to week four for the whole group. The findings are discussed in relation to the literature, and the implications for nursing practice, education, administration and research are presented.
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Chapter One: Introduction

Breastfeeding a preterm infant can be challenging, but for most mothers “the rewards outweigh the efforts” (Kavanaugh, Meier, Zimmerman, & Mead, 1997, p. 15). Hospital stays for preterm infants have shortened, and the ability of the infant to suckle well at the breast is seldom a criterion for discharge. As a result, mothers of these infants are likely to experience breastfeeding problems after hospital discharge (Hill, Ledbetter & Kavanaugh, 1997).

The feeding of preterm infants has long been based on tradition and experimentation (Lefrak-Okikawa & Meier, 1993). Research that examines breastfeeding among preterm infants after hospital discharge has occurred only in the last decade. There have been few randomized controlled trials associated with feeding choices or ingestion of specific nutrients for preterm infants (Canadian Pediatric Society, 1995). There have been no published experimental research studies about the benefits of interventions to support breastfeeding preterm infants. The published research, reviewed in Chapter Two, is based on descriptive or qualitative approaches, which have examined the experience of mothers, the incidence and duration of breastfeeding, and clients’ reactions to interventions.

Successful breastfeeding provides many advantages for preterm infants and their mothers. Infants receive the particular immunologic and nutritional properties of human milk that cannot be duplicated by commercial formulas (Canadian Pediatric Society, 1995). Research findings have shown that human milk and breastfeeding of infants decreases the incidence and/or the severity of diarrhea, lower respiratory tract infection, otitis media, bacteremia, bacterial meningitis, botulism, and urinary tract infections (American Academy of Pediatrics, 1997). Long term benefits of breastfeeding include a decreased risk of becoming overweight or obese (von Kries et al., 1999; Wilson et al., 1998), and potential for cognitive development (American Academy of Pediatrics, 1997; Horwood & Fergusson, 1998).
Breastfeeding has also been shown to be prophylactic against atopic disease, including atopic exzema, food allergy, and respiratory allergy, throughout childhood and adolescence (Saarinen & Kajosaari, 1995).

For preterm infants there are additional benefits associated with breastfeeding. Preterm infants fed human milk have greater enteral feeding tolerance and more rapid achievement of full enteral feedings (Martinez & Desai, 1995), reduced risk of and severity of infection in the short and long term (Schanler, Shulman & Lau, 1999), reduced risk and severity of necrotizing enterocolitis (Schanler et al.), and enhanced developmental and neuro-cognitive outcomes (Jacobson, Chiodo & Jacobson, 1999).

For mothers of preterm infants, breastfeeding may enhance maternal involvement and control over their infants’ care (Meier & Brown, 1996). Mothers report rewards of breastfeeding that include: knowing they are providing the healthiest nutrition for their infant, enhancing closeness between mother and infant, perceiving infant contentment and tranquility during breastfeeding, providing convenience for the mother, and giving the mother a tangible claim on her infant (Kavanaugh et al., 1997).

Statement of the Problem

Breastfeeding provides highly specific health benefits for preterm infants that are in addition to those documented for term infants (Kavanaugh et al., 1997). Initiation and duration of breastfeeding is lower in the preterm population than in the term population, related to the challenges of feeding a premature infant (Hill et al., 1997). Interventions to prevent breastfeeding failure for preterm infants while in hospital have been studied (for example, Kliethermes, Cross, Lanese, Johnson & Simon, 1999; Meier et al., 1993), however, there is a lack of research about breastfeeding premature infants in the period following hospital discharge. A notable exception is the series of studies describing the breastfeeding patterns and problems of 110 mothers of low birth weight infants completed by Hill and her colleagues.
(Hill Anderson & Ledbetter, 1995; Hill, Brown & Harker, 1995; Hill, Hanson & Mefford, 1994; Hill et al., 1997). This research described the rates of breastmilk feeding and infant feeding directly at breast in the post discharge period and relationships to other factors including timing and frequency of breast expression, and delayed initiation of breastfeeding. Hill and her colleagues based the classification of infants on birth weight rather than gestational age, and only 20 of the 110 infants were less that 34 weeks gestation at birth. Further research that describes the breastfeeding patterns of preterm infants and the factors associated with exclusive breastfeeding is needed. Lack of knowledge regarding how preterm infants breastfeed after they have been discharged from hospital hampers health professionals' abilities to assist mothers of preterm infants to meet their breastfeeding goals.

Breastfeeding is influenced by a complex interplay of factors related to the mother, her support network, and the infant (Lothian, 1995). The transition from primarily bottle feeding to primarily breastfeeding in the post discharge period is related to the confidence and competence of the mother, the quality of her social support, and the ability of her infant to breastfeed and provide cues for care. The relationship between these factors has received some attention in a full-term population. Virden (1988) found that a mother’s perception of success with infant feeding is interpreted as evidence of her success as a mother. Breastfeeding success has been associated with enhancement of maternal role attainment and self esteem (Brandt et al., 1998). In the only study examining maternal confidence and feeding choice, Hall, Shearer and Kavanaugh (1997) found no significant differences in confidence between breastfeeding and formula feeding mothers of preterm infants, and more research examining this relationship is needed. There appears to be a lack of consensus about the nature of breastfeeding, patterns of breastmilk feeding, and feeds directly at breast and their impact on maternal confidence and competence in specific preterm populations. These gaps lead to the research questions for this study.
Research Questions.

The research questions are:

1. What are the weekly breastfeeding patterns (breastmilk feedings and feeding modes) of preterm infants who are 30-34 weeks gestation from the day of hospital discharge to four weeks post-discharge?
2. What are the relationships between breastmilk feedings and feeding modes at one, two, three, and four weeks post hospital discharge?
3. What are the relationships between the breastmilk feedings of preterm infants at one week and four weeks post hospital discharge and their mothers’ perceived confidence and competence?
4. What are the relationships between the feeding modes of preterm infants at one week and four weeks post hospital discharge and their mothers’ perceived confidence and competence?

Purpose

The purpose of this study was to describe the breastfeeding patterns of preterm infants born at 30 to 34 weeks gestation for four weeks following hospital discharge. The relationships between breastfeeding patterns (breastmilk feeding and feeding mode), and maternal confidence and perceived competence were explored.

Assumptions

Breastfeeding is a complex activity that is influenced by the interplay of factors related to the mother, the infant, and the environment. It is assumed that the factors measured are important to the success of breastfeeding, but not exhaustive of all possible factors that influence the success of breastfeeding. Prematurity is assumed to be a factor that negatively affects the success of breastfeeding.
Achievement of maternal identity is the result of the process of maternal role attainment. Maternal role attainment is affected by the mother's qualitative perception of the infant, her role competence, and role satisfaction (Zabielski, 1994). Maternal confidence is the affective component of maternal role attainment and role competence is associated with the behavioral component of maternal role attainment (Zahr, 1993). Social support is a factor that is positively correlated with maternal role attainment (Mercer, 1985; Reece, 1993; Rubin, 1984; Zahr, 1991b). It was assumed that instruments used in the study accurately reflect the concepts of maternal confidence, perceived competence, and social support.

It was assumed that the study participants read the instructions for the diaries and the questionnaire items correctly. As well, it is assumed that the participants responded appropriately and truthfully on the questionnaires and the feeding diaries.

Theoretical Framework

The process of maternal role attainment as described by Mercer (1985, 1995) provides the theoretical framework for this study. Maternal role attainment has been derived from role theory and from a symbolic interactionist perspective (Flagler, 1988; Mercer, 1985; Walker, Crain & Thompson, 1986; Zabielski, 1994). Each role has a reciprocal role partner and interaction between the role partners modifies and validates each partner's role behavior (Zabielski, 1994). In this model, a woman defines her mothering role in the interaction with her infant (Mercer, 1985). Attainment of the maternal role occurs over time and Mercer (1985, 1995) described four stages through which a mother progresses. In the anticipatory stage, mothering behaviors are learned indirectly as the woman is mothered as a child, and more directly as the woman seeks out role models during pregnancy. With the birth of the child, the formal/role taking stage of mothering begins during which role-taking behaviors are guided largely by directives from professionals and others in the mother's social system. The informal/role-making stage corresponds with the mother developing her own unique way of
mothering. The final stage of maternal role attainment, the personal role/identity stage, is reached when the woman has integrated the role into her self system and feels a congruence of self and role as others accept her role performance. She is now secure in her identity as a mother, is emotionally committed to her infant, and feels a sense of harmony, satisfaction, and competence in the maternal role.

Maternal factors such as parity, age, education, and perceived support as well as the infant as a role partner have all been found to affect maternal role attainment (Zabielski, 1994). The preterm infant is a very different role partner than the fullterm infant. Preterm infants are unpredictable and less responsive than fullterm infants (Zabielski, 1994; Zahr, 1991a). Social support is an important factor that influences maternal role attainment (Mercer, 1985; Rubin, 1984; Reece, 1993; Zahr, 1991b). Social support is generally considered to have a number of dimensions, including instrumental assistance, information provision, and emotional empathy and understanding (Crnic, Greenberg, Ragozin, Robinson & Basham, 1983).

The attainment of the maternal role can be measured through accessing maternal self-confidence or maternal role competence. Self-confidence in role performance has been used by some authors as an indicator of maternal role attainment (Hall et al., 1997; Walker et al., 1986; Zahr, 1991a). Other authors measure the behavioral component of the maternal role, maternal role competence (Walker et al., 1986; Zahr, 1991a). This can be done by observation or self-report. There is not necessarily a correlation between maternal self-confidence and maternal role competence as a mother may be performing the skills of parenting with ease but not feel confident in the role (Zahr, 1991a). In this study, perceived maternal confidence and competence were measured in the post-discharge period and their relationships to breastfeeding were examined.
Overview

This ex-post facto, descriptive correlational study describes the breastfeeding patterns (breastmilk feedings and feeding modes) of preterm infants through a detailed examination of feeding diaries completed by infants’ mothers for the four weeks following the infant’s discharge from hospital. The relationship between the breastmilk feedings and feeding modes, and maternal perceived confidence and competence is explored. In Chapter Two, the literature on breastfeeding preterm infants is reviewed and the theoretical framework is described. In Chapter Three, the sample and methods are discussed. Chapter Four presents the results of the data analysis. The results are discussed in Chapter Five, and the implications for nursing practice, education, administration and research are presented in Chapter Six.
Chapter Two: Literature Review

This chapter presents a review of the literature relevant to this study and the theoretical framework. Major sections include controversies associated with breastfeeding preterm infants, post discharge breastfeeding of preterm infants, and maternal role attainment.

The literature for review was collected in a number of ways. A literature search was completed using CINAHL and Medline databases for articles published up to September 1999. Since that time, new publications and current journals have been scanned periodically for the most recent literature on breastfeeding preterm infants. Other sources of literature were found by reviewing reference lists in published articles, reviewing the references used in the study in which the data were originally collected, and in articles suggested by colleagues who were aware of the thesis topic.

Controversies Associated with Breastfeeding Preterm Infants

The research that addresses breastfeeding preterm infants is difficult to interpret due to the lack of precision in describing the population of preterm infants, and there are few studies employing an experimental design. There is considerable debate in the literature about breastfeeding preterm infants. These controversies include lack of precision in classifying preterm infants, the suitability of mother's milk for preterm infants, the ability of preterm infants to feed at the breast, lack of clarity in classifying breastfeeding for preterm infants, and the escalation and use of technology associated with breastfeeding preterm infants.
Definition of the Preterm Infant Population

In reviewing the literature, the lack of precision about the definition of the population under study, and the variety of ways that the population has been defined has made comparing results and recommendations from studies difficult. Much of the literature has classified the population according to birth weight, with low birth weight (LBW) defined as all infants under 2500 grams, very low birth weight (VLBW) as 1000 to 1500 grams, and extremely low birth weight (ELBW) as less than 1000 grams (Beischer, Mackay, & Colditz, 1997). The problem with this approach is that it gives no information about gestational age and whether the infants were the appropriate size for their gestational age. One study that did acknowledge gestational age when comparing the breastfeeding patterns of low birth weight infants (Hill et al., 1994) found significant differences between groups of different gestational ages, illustrating the importance of classifying infants both by weight and gestational age.

Other studies use gestational age and define a premature infant as any neonate, regardless of birth weight born prior to 37 weeks gestation (Urdang, 1983). Infants now can survive at gestational ages as young as 24 weeks, and the survival rates for infants born at 27 or 28 weeks are improving (Hack et al., 1995). The very premature infants who would not have survived except for extraordinary medical support have different nutritional needs than those born at 30 to 34 weeks who need short-term medical support, and those born at 34 to 37 weeks who require little medical intervention (Thilo & Rosenberg, 1999). Because of the different needs of the population of premature infants, it is difficult to generalize research findings or to make recommendations that do not specify the gestational age of the infants.

Suitability of Mother's Milk for Preterm Infants

There are many benefits to feeding preterm infants their own mothers' milk. In addition to the bioavailability of nutrients, human milk also has anti-infectious properties, facilitates digestion, and favors intestinal maturation (Martinez & Desai, 1995). Early preterm
mother's milk is more dense in nutrients than milk from mothers delivered at term and therefore comes closer to providing the nutrient requirements of preterm infants (Canadian Pediatric Society, 1995; Martinez & Desai). However, preterm infants fed exclusively human milk have slower growth patterns, and may show symptoms of micronutrient deficiency resulting in impaired bone mineralization (Martinez & Desai). Most of the feeding studies regarding human milk in the preterm population, however, have been conducted with pooled human milk which is associated with a slower growth rate than when infants are fed their own mother's milk (Martinez & Desai). Martinez and Desai report that conflicting findings remain in the literature regarding the adequacy of growth for infants fed their own mother's milk.

The Canadian Pediatric Society (1995) concluded that unfortified milk from the infant's own mother is inadequate as a sole source of nutrients. They state, however, that their guidelines are based on intrauterine growth curves. Guidelines were recommended despite an acknowledgement that there are few randomized clinical trials of feeding infants specific nutrients or of feeding choices. They recommend fortified milk from the infant's own mother or formula designed for premature infants as the feeding of choice for premature infants with a birth weight of less than 1800 grams and possibly up to 2000 grams or a gestational age of less than 34 weeks and up to 38 weeks because at this age the infant is often able to nurse effectively.

This position was sharply criticized by breastfeeding advocate Jack Newman (1995). He challenges the premise that preterm infants should grow at intrauterine rates, because the validity of using the intrauterine growth rates as the standard on which to base the nutritional requirements of preterm infants has not been proven conclusively. Infants ex utero are subject to stresses not encountered in utero that have an impact on growth, therefore, it does not follow automatically that it is most desirable for them to achieve the same growth as is achieved in utero (Berry, Conrod & Usher, 1997; Martinez & Desai, 1995). In fact, two recent
studies of growth patterns of very premature infants have found that these infants, on average, do not grow as quickly as a comparable fetus (Berry et al., 1997; Ehrenkranz et al. 1999). There is no scientific evidence that infants who grow at intrauterine rates have better long term outcomes than those who grow more slowly (Newman).

Martinez and Desai (1995) point out that it is intelligence not somatic growth that determines the success of a person, and that using somatic growth as the standard of dietary adequacy may require excessive nutritional supplies and lead to high serum levels of amino acids which may impair brain growth. However, there is some evidence that premature infants with birth weights less than 1500 grams who were still small at 40 weeks gestation, but caught up by eight months, did well neurologically and those who had not caught up by eight months did not (Berry et al., 1997).

The long-term safety of breast-milk fortifiers and formulas has not been established, and there is no proof that infants fed fortifier or formula do better in the long run (Canadian Pediatric Society, 1995; Newman, 1995). For example, Schanler et al. (1999) compared fortified human milk with preterm formula, and found significant benefits for the infants who were fed fortified human milk. However, the authors acknowledged that nutrient supplementation of human milk may affect the intrinsic host defense properties as well as the GI tolerance of human milk. They stated that for ethical reasons relating to standard of care they could not conduct a comparison of fortified and unfortified human milk, despite the fact that fortification has never been examined in a clinical trial and unfortified maternal breastmilk has been fed to preterm infants for as long as mothers have been having them.

On the other hand, preterm infants fed human milk may not receive adequate intakes of protein, calcium, and phosphorus, and, possibly, zinc and copper (Schanler & Hurst, 1994). Authors recommend that preterm infants who weigh less than 2000 grams and are less that 35 weeks gestation receive breastmilk fortified with a commercial fortifier, and the addition of an
iron supplement two weeks after full enteral feeding is achieved (Schanler & Hurst). Infants who are fed fortified human milk have a slower weight gain (22 ± 7 vs. 26 ± 6 grams/day), decreased length increment and sum of five skinfold measures when compared to infants fed preterm formula (Schanler et al., 1999). A standard of care has been set for 15 grams per kilogram per day as a minimal rate of growth (Meier, Brown & Hurst, 1999). Infants who are not achieving this growth rate may be fed their mother’s hind milk because it is higher in lipids and calories (Meier, Brown & Hurst; Schanler & Hurst). No research has been undertaken to examine the effects of feeding preterm infants hindmilk only.

Breastfeeding Abilities of the Preterm Infant

There is evidence of greater physiological stability for preterm infants during breastfeeding as opposed to bottle-feeding. For example, extremely low birth weight infants demonstrated a higher oxygen saturation and higher temperature during breastfeeding than during bottle-feeding, and were less likely to desaturate to less than 90% oxygen during breastfeeding (Bier et al., 1997). Dowling (1999) examined the physiological effects of breastfeeding and bottle-feeding with an orthodontic nipple on preterm infants who acted as their own controls. She found that infants breathed more during sucking bursts for breastfeeding sessions when compared to bottle-feeding sessions and had fewer episodes of oxygen desaturation during breastfeeding. Recent research into Kangaroo care shows that the skin to skin contact between mother and infant, as is usual in breastfeeding has significant benefits to the infant's health and physiological stability (Charpak, Ruiz-Pelaez, Figueroa de C, & Charpak, 1997).

Underconsumption of milk by breastfeeding alone is a concern expressed by several authors (Bier et al, 1999; Meier, Brown & Hurst, 1999; Meier & Brown, 1996). However, there are studies that suggest that concern is overstated. In India the weight gain of 355 preterm, low birth weight (LBW) infants exclusively breastfed by their own mothers after
NICU discharge was examined. They found that infants born at 32 weeks gestation had a growth delay of up to three weeks followed by a brisk catch up phase and infants born at 34 to 36 weeks had a shorter delay of two weeks (Ramaseshu, Jeyaseelan & Kirubakaran, 1993). The weights attained were comparable to intra-uterine growth rates and are evidence that preterm infants born after 32 weeks can adequately regulate milk intake and grow if given time. Some studies have shown that infants take significantly less milk while breastfeeding as opposed to bottle-feeding. In a study of ELBW infants the mean weight gain during a bottle-feeding session was greater than during a breastfeeding session (31 grams vs. 9 grams) (Bier et al, 1999). In this study the infants had limited experience with breastfeeding, with the initiation of breastfeeding at a mean gestational age of 35 plus or minus two weeks. As a result of concerns about the volume of milk taken at each feeding, interventions, such as routine test weighing, and the use of nipple shields have been suggested and studied (Meier, Brown & Hurst, 1999).

Lack of Clarity in Classifying Breastfeeding for Preterm Infants

In 1988, the Interagency Group for Action on Breastfeeding presented a schema and framework to accurately describe and interpret breastfeeding practices (Labbok & Krasovec, 1991). The schema was developed because lack of precision and consistency in the definition of breastfeeding had led to misinterpretation of data and problems with comparability between studies (Armstrong, 1991; Labbok & Krasovec). The schema distinguishes between full (subdivided into exclusive and almost exclusive) and partial (subdivided into high, medium and low) breastfeeding, and token breastfeeding. Hill et al (1997) have modified the schema to include estimates of the number of formula or solid feeds per day. Such a modification is useful if the mothers are asked to recall the numbers of formula and/or breast feeds, but if feeding diaries are used to record feeds the original schema with the percentage of feeds would represent a more accurate estimate. The schema definitions are those
recommended for use by the editors of the Journal of Human Lactation, and the Journal of Nurse-Midwifery (Burgin, 1996). The Institute for Reproductive Health at Georgetown University is urging other journals to adopt this schema as guidance for use in studies (Labbok & Coffin, 1997).

Researchers who conduct preterm breastfeeding studies have criticized this schema because they have argued that it does not accurately describe the breastfeeding situation for preterm infants and their mothers (Meier & Brown, 1997). One concern is that the schema does not distinguish between mothers providing expressed breastmilk for their infant and feeding their infant at the breast, classifying both as breastfeeding exclusively (Meier & Brown). Hill et al., (1997) examined the utility of the breastfeeding schema and concluded that it does not appear to fit the breastfeeding patterns of the preterm/low birth weight infants because the mothers reported complementation, instead of or in addition to supplementation, and the use of expressed mother's milk, instead of or in addition to formula, for the extra feedings. Hill et al. suggested that subsequent research should focus on further refinement of this tool. The lack of an adequate tool to define breastfeeding for preterm infants has resulted in researchers classifying breastfeeding in different ways.

Increasing Technology Associated with Breastfeeding

A recent trend noted in the literature is the increase in technology associated with breastfeeding a premature infant. Papers presented at the Pediatric Academic Societies' (1999) Annual Meeting illustrate this trend. The abstracts describe estimating and modifying the lipid and caloric content of expressed mother's milk through a creamocrit technique (Bigger, Griffin, Meier & Engstrom, 1999; Meier, Murtaugh, Vasan, Meier & Schanler, 1999), test-weighing to measure milk intake during breastfeeding at home by mothers of preterm infants (Hurst, Meier & Engstrom, 1999), and using nipple shields to increase milk intake during breastfeeding (Meier, Brown, Hurst, Spatz & Engstrom 1999). The latter two studies were
partially and fully funded by Medela, a company manufacturing infant scales and nipple shields.

The use of milk fortifiers and lactoengineering of mother’s own milk to provide hindmilk that is higher in calories is discussed at length in a recent chapter on breastfeeding the preterm infant (Meier, Brown & Hurst, 1999). The authors did not question the need for milk fortifiers, however, they did acknowledge that hindmilk feeding has not been tested in randomized control trials. Also, they did not specify which preterm infants might benefit from fortifiers or hindmilk feeds. The needs of the mother are discussed; including the risk that she may infer that her milk is not adequate for her infant because of the alteration to it, but they argued that lactoengineering might be empowering for mothers.

Newman (1995) maintained that the Canadian Pediatric Society's recommendation to fortify breastmilk for all preterm infants follow a trend in recent Canadian Pediatric Society statements on infant feeding, which have served to increase the sales and profits of formula manufacturers. A similar argument could be made for the interventions previously discussed for use by mothers when feeding preterm infants at home, because they lead to demand for products like scales, breast pumps, and the creamocrit that parents would need to rent or buy. Breastfeeding appears to be following other aspects of women's reproductive lives when technology and prescriptive approaches remove control and power from women and place it in the hands of professionals (Van Esterik, 1994).

**Post Discharge Breastfeeding of Preterm Infants**

Breastfeeding patterns of preterm infants after hospital discharge have been studied only in the past decade. In 1993, Meier et al. reported that they could not locate any research literature addressing postdischarge management of breastfeeding preterm infants. They expressed concern about the high percentage (30-70%) of mothers who discontinued breastfeeding efforts before hospital discharge (Meier et al., 1993). Concerns have also been
expressed about the low percentage (55-58%) of women who have even initiated lactation after the birth of their preterm infants (Ehrenkranz, Ackerman, Mezger & Braken, 1985; Lefebvre & Ducharme, 1989). The low numbers of mothers who were discharged while still breastfeeding preterm infants resulted in interventions to promote breastfeeding occurring primarily during hospital stays. The reported incidence of breastfeeding preterm infants in Vancouver, British Columbia may be higher than those cited above as the breastfeeding rate for preterm infants is linked to the rate for full term infants (Lefebvre & Ducharme, 1989). In Vancouver, a recent study reported that 83% of women with infants over 37 weeks gestation breastfeed, with the majority doing so exclusively (Williams, Innis, Vogel & Stephen, 1999).

Concerns of Mothers Breastfeeding Preterm Infants after Hospital Discharge

Kavanaugh, Mead, Meier, and Mangurten (1995) examined mother’s concerns about breastfeeding a preterm infant after discharge. They interviewed 20 mothers of preterm infants and found that three categories of maternal concerns emerged from the data: whether the infants consumed an adequate volume of milk during breastfeeding, the composition of the milk, and the mechanics of feeding a preterm infant. Mothers were interviewed at about 34 days post discharge. Seventeen of 20 were still breastfeeding, whilst the other three had weaned in the month since discharge. Fifteen of 20 expressed concern about whether their infant was consuming an adequate volume of milk by only breastfeeding. The amount of concern varied from small to very large, with one mother bottle-feeding breast milk for the first two weeks after discharge. The authors did not indicate how many of the mothers in this group had very large concerns.

In Kavanaugh et al.'s (1995) study there were five reasons why mothers were concerned about breastfeeding: (a) the infant was small/premature, (b) the mother was unable to quantify intake, (c) there was an insufficient supply at a specific feeding, (d) infant cues suggested inadequate intake, and (e) nurses' who modeled bottle feeding in hospital and used
techniques to coax infants to eat more. In order to manage these concerns, the mothers identified the two following strategies: using complemental and supplemental feeds, and learning and assigning meaning to infant cues that suggested the infant was getting enough. The ability to interpret infant cues is a sign that a mother is moving into the informal stage of maternal role attainment where she develops her own style of mothering.

Many mothers who were still breastfeeding at the time of the interview, described a turning point at approximately two weeks post discharge when something happened to make them less concerned about their infants getting enough. At this point, the mothers either eliminated bottle-feeding entirely or significantly decreased the frequency of offering bottle-feeds. The turning point related to the infant’s weight and weight gain, and a change in the infant’s cues. Mothers felt that the infants were able to breastfeed better and/or longer, and could communicate fullness (Kavanaugh et al., 1995). It is also possible that the turning point related to mothers’ increased confidence in their abilities to read their infants’ cues.

From the same sample, Kavanaugh et al. (1997) explored the rewards and efforts of breastfeeding a preterm. At the time of the interview, 17 of the 20 mothers were still breastfeeding. Many rewards of breastfeeding were reported including: knowing they were providing the healthiest nutrition for the infant, enhancing closeness between mother and infant, perceiving infant contentment and tranquility during breastfeeding, providing convenience for the mother, and giving the mother a tangible claim on the infant. All mothers described at least one of these rewards, and at least half named most of them.

The efforts of breastfeeding included coping with lifestyle changes brought about by breastfeeding and new motherhood which are similar to those described by mothers of full term infants (Bottorff, 1990). Efforts also included loss of control and predictability of daily schedules, and inconvenience such as leaking breasts, breast discomfort, and exclusion of foods from their diet. Several women did not breastfeed in public and felt tied down. Eleven
felt exhausted. The mothers who were breastfeeding and pumping attributed the exhaustion to breastfeeding. Nineteen of the 20 mothers felt the rewards outweighed the efforts (Kavanaugh et al., 1997).

In 1993, Meier et al described their model of breastfeeding support services to families with infants in a NICU. In their program, 71.2% of mothers who had initiated lactation were breastfeeding at the time of discharge. Breastfeeding was defined as any combination of feeding at the breast and feeding expressed mother’s milk (EMM) by bottle or supplemental nurser. When the mothers were contacted following discharge nearly all of them had at least one major concern about breastfeeding, and most had concerns about the adequacy of infant intake. At that time (1992), the researchers were unable to locate research literature addressing the post discharge management of breastfeeding for preterm infants. They concluded that little was known about the breastfeeding needs of these mother-infant pairs after discharge, and virtually nothing was known about effective intervention strategies. They recommended future research so that breastfeeding failure for the mothers of these infants be prevented (Meier et al).

Hill et al. (1994) did an inductive analysis of the reasons for decline in breastfeeding. The two most common factors identified by mothers was the perception that they had an inadequate milk volume, and their concern that the baby wasn't getting enough milk. The most commonly cited infant factor for decreasing breastfeeding was fussiness after feeding. These factors are similar to those found by Hill and Humenick (1996). In their study, a mothers' perception of insufficient milk supply was most closely tied to her perception of infant satiety. This study highlighted the problems that mothers had in making the transition from pumping to feeding at the breast.
Patterns of Breastfeeding in Preterm Infants

A number of studies have documented the incidence and duration of breastfeeding in the preterm population. Lefebvre and Ducharme (1989) described the incidence and duration of lactation and lactational performance among term and LBW infants in Montreal. Families were followed until lactation ceased. The incidence of lactation at delivery was 73% for the control group (term infants) and 58% for the LBW group. At discharge, 65% of the breastfed infants in the control group were exclusively breastfed as opposed to only 3% of the LBW group. The mean duration of breastfeeding was 3.2 months for the control group and 2.5 months for the LBW group. Thirty seven percent of LBW infants fed breastmilk failed to breastfeed directly compared to only 2% in the control group. Only 31% of the LBW infants were exclusively breastfed compared to 85% of the control group. During the mid-eighties, this study highlighted the differences between LBW and term infants in relation to breastfeeding incidence and duration.

Furman, Minich and Hack (1998) examined the rate of breastfeeding among mothers of VLBW infants and the sociodemographic and neonatal factors associated with the decision to breastfeed. They also studied the correlates of continuing milk pumping and the transition to nursing at the breast. The rate of initiation of lactation and duration of pumping was low with 39 of 82 mothers choosing to initiate pumping (48%), and 19 of the 39 (49%) still pumping at the time of the infant’s discharge. Of the 19 mothers, only eight made a successful transition to nursing at the breast (defined as breastfeeding at least half of the time), therefore only 10% of the mothers in the study eventually breastfed. The mothers who were still pumping at discharge were white, and older than those who discontinued pumping, and 84% had decided prior to delivery to breastfeed. Their infants had a lower rate of apnea of prematurity, a shorter hospital stay, and shorter duration of oxygen dependence. All who continued pumping reported a high level of support from the father of the baby and 11 of the
19 felt that they had good to excellent support from the nurses and doctors. The eight who made the transition to the breast did not differ in sociodemographic or pregnancy descriptors from the eleven who did not make the transition (Furman et al.).

Ramasethu et al., (1993) followed 355 preterm infants in Southern India who were exclusively breastfed by their mothers after NICU discharge. Length of hospitalization was comparable to western standards, with very low birth weight infants (mean birth weight 1348 grams, gestational age 32.7 weeks) being discharged at a mean age of 17.8 days and LBW preterm infants (mean birth weight 1798 grams, gestational age 34.5 weeks) being discharged at a mean age of 10.8 days. The infants were managed at home with no medical supervision other than weekly or monthly follow up visits to the hospital. Preterm infants born at 32 weeks gestation had a period of growth delay of up to three weeks followed by a brisk catch up phase during which the infants surpassed the expected growth (according to intrauterine growth curves) and infants born at 34 to 36 weeks had a shorter (two week) delay. This study illustrates that preterm infants have the ability to grow appropriately without interventions such as pumping or supplementation with expressed mother's milk or formula, and that mothers have the ability to breastfeed preterm infants successfully without extensive nursing or medical interventions.

A series of studies were completed by Hill and her colleagues on the post hospital breastfeeding of 110 LBW infants. Hill et al. (1994) examined the breastfeeding patterns and problems of mothers of LBW infants. One hundred and ten mothers and infants were surveyed eight weeks after delivery to determine the pattern of breastfeeding at discharge and at the time of the interview. The sample was composed of preterm and full term infants, with 20 infants having gestational ages of less than 34 weeks, and 60 infants with gestational ages between 34 and 36 weeks. The mothers were also asked about problems encountered that led to providing less breast milk or weaning. Inclusion criteria specified that the infant was to
have begun to feed directly at the breast by 6 weeks. Of the 129 mothers contacted 12 infants (10%) never fed at the breast as the infant would not latch on. These infants were excluded from the study but it is unknown if they received EMM or formula. Seven infants that were included did not breastfeed at all until after discharge. At eight weeks 28% of the sample was providing mother’s milk exclusively or almost exclusively (at breast with some EMM and occasional artificial milk). Fourteen percent received greater than 80% mother’s milk, 11% received 20-80% mother’s milk, 4% received less than 20% mother’s milk, and 43% were weaned. These researchers used a modified version of the Labbok and Krasovec breastfeeding schema to classify breastfeeding.

Hill, Brown, and Harker. (1995) described the initiation and frequency of breast stimulation in mothers delivering VLBW and LBW infants. They examined the relationship between early initiation and breastfeeding pattern at eight weeks postpartum in the mothers of LBW infants. At eight weeks postpartum, they found no statistical differences between early initiation (before 24 hours) and late initiation. The breastfeeding patterns of the whole group were as follows: 53% of term LBW and 41% of preterm LBW infants were receiving mothers’ milk exclusively but the mode of feeding was not specified; 23% of term LBW and 29% of preterm LBW infants received partial mother’s milk feeds; and 23% of term LBW and 30% of preterm LBW infants were weaned. They found that, on average, mothers of LBW infants that were unable to feed at the breast, pumped four times a day, and mothers of VLBW infants pumped three to four time a day, significantly less than what is recommended by the nurses in the NICU (Hill, Brown & Harker).

Hill, Anderson, and Ledbetter (1995) examined the experiences of 13 mothers whose preterm infants did not suckle at the breast until day 14 or later. At eight weeks postpartum, six were exclusively receiving mother’s milk (four directly from the breast, one with a nipple shield, and one bottle-feeding EMM). Two of the four who were breastfeeding directly gave
EMM with a bottle if the infant was fussy, or to make sure the infant was getting enough. Four of the 13 were partially providing mother’s milk and giving artificial milk. One was giving 80% EMM with a bottle with the rest of feeds comprised of artificial milk, two were breastfeeding and feeding formula after breastfeeds, one was alternating breast with formula, and one was only giving 20% mother’s milk and supplementing with formula and solids (cereal). Three had weaned. This research highlighted the variability among preterm infants within the classification of breastfeeding as set out by Labbok and Krasovec. It also showed the low incidence of achieving full breastfeeding in this population.

Hill et al., (1997) examined the breastmilk feeding pattern and feeding mode of LBW infants on the day of discharge and four weeks later. The LBW infants (n=110) were divided into three groups a) fullterm (37 to 41 weeks), b) preterm (34 to less than 37 weeks), and c) preterm (30 weeks to less than 34 weeks). They used the Infant Breastfeeding Assessment Tool (IBFAT) and the Labbok and Krasovec breastfeeding schema to address infants’ breastfeeding patterns and effectiveness of infant feeding at breast as reported and rated by the mothers. On discharge mothers rated the effectiveness of their infants’ breastfeeding, and only 52% of the fullterm and 52% of the preterm LBW infants were judged as feeding effectively. At hospital discharge, 38% of the LBW infants (all gestational ages) were exclusively fed at the breast. In the preterm group (30 to 34 weeks), 55% received all mother’s milk, but only 20% received it exclusively at the breast on hospital discharge indicating that receiving bottle feeds may be associated with infrequent breastfeeding before hospital discharge. Four weeks later these numbers were essentially unchanged.

Hill et al. (1997) made a number of recommendations for future research in relation to breastfeeding preterm infants. The authors recommended a more specific tool be used to categorize or define breastfeeding for preterm infants; subsequent research could focus on further refinement of the adapted breastfeeding schema that was used in their study. The tool
would assist in comparing research studies and would facilitate the examination of relationships between selected in-hospital interventions for the less mature, smaller infant and breastfeeding outcomes at four weeks after discharge or later.

**Maternal Role Attainment**

The process of maternal role attainment as described by Mercer (1985, 1995), provided the theoretical framework for the study. Although maternal role attainment has been studied almost exclusively with mothers of fullterm infants, it is equally important in the preterm population. The concepts of maternal confidence and competence are central to the theory of maternal role attainment. There are many factors that influence maternal role attainment, with social support being an important influence. Factors that influence maternal role attainment, also have been shown to be linked to breastfeeding success.

**Maternal Role Attainment Theory**

Maternal role attainment is defined as "a process in which the mother achieves competence in the role and integrates the mothering behaviors into her established role set, so that she is comfortable with her identity as a mother" (Mercer, 1985, pp. 198). The major components of the mothering role include "attachment to the infant through identifying, claiming and interacting with the infant, gaining confidence in mothering behaviors, and expressing gratification in the mother-infant interactions" (Mercer, 1995, pp.13).

Maternal role attainment has been derived from role theory with a symbolic interactionist perspective (Flagler, 1988; Mercer, 1985; Walker et al., 1986; Zabielski, 1994). Each role has a reciprocal role partner. Interaction between the role partners changes the other partner's role behavior through modification and validation (Zabielski, 1994). In maternal role attainment theory, a woman defines her mothering role through interacting with her infant (Mercer, 1985).
Mercer (1985, 1995) proposed a theoretical framework for the process of maternal role attainment during the first year after birth. Her framework built on Rubin's (1967, 1984) research which focussed largely on pregnancy and the first postpartal month (Mercer, 1995). In the anticipatory stage, mothering behaviors are learned indirectly as the woman was mothered as a child, and more directly as the woman seeks out role models during pregnancy. With the birth of the child, the formal/role taking stage of mothering begins during which role-taking behaviors are guided largely by directives from professionals and others in the mother's social system. The informal/role-making stage corresponds with the mother developing her own unique way of mothering. The woman structures the maternal role to fit herself according to her past experiences and future goals, learns her infant's cues, and begins to develop her own unique style. The final stage of maternal role attainment, the personal role/identity stage, is reached when the woman has integrated the role into her self system and she feels a congruence of self and role as others accept her role performance. She is now secure in her identity as a mother, is emotionally committed to her infant, and feels a sense of harmony, satisfaction, and competence in the maternal role (Mercer).

Walker et al. (1986) examined the construct of maternal role attainment as described by Mercer. They differentiated between maternal role attainment and maternal identity. They described maternal identity as a distinct component of maternal role attainment that is focussed on the cognitive and affective attributes of the mother-infant relationship. Maternal role attainment was defined and operationalized in terms of self-confidence in role performance. It was characterized as a phenomenon that appears to contain several distinct components including maternal identity, perceived (subjective) role attainment, and demonstrated (behavioral) role attainment. Zabielski (1994) refuted the need to differentiate between maternal identity and maternal role attainment. When she studied maternal identity in preterm and fullterm mothers their maternal identities were triggered not only by cognitive
phenomena (role expectations and role qualities), but also by performance phenomena (role actions).

In the literature, attainment of the maternal role has primarily been measured using two methods. Achievement of maternal identity has been used by some to identify maternal role attainment. In these studies the woman is asked when she really felt like a mother (Entwisle & Doering, 1981; Mercer, 1985; Zabielski, 1994). Other authors have used self-confidence in role performance as the indicator of maternal role attainment (Hall et al., 1997; Walker et al., 1986; Zahr, 1991a).

The behavioral component of the maternal role can be equated to maternal role competence (Walker et al., 1986; Zahr, 1991a). Role competence is related to the knowledge a person has of the role and the ability to attain that role (Zahr, 1991a). It has been assessed through observing maternal behaviors (Walker et al., 1986; Zahr, 1991a) or eliciting maternal perceptions about competence (Mercer, 1985). Maternal confidence and competence are not necessarily correlated as a mother may be performing the skills of parenting with ease but not feel confident in the role (Zahr, 1991a).

Maternal Confidence and Competence

Zahr (1991a) examined maternal confidence and mother's behavior toward her infant expressed by mothers who had given birth to premature infants. She used a theoretical framework of maternal role attainment and role competence. Maternal confidence was defined as the "perception mothers have of their ability to care for and understand their infants" (pp. 280). It was closely related to maternal identity and maternal role competence and attainment. Zahr (1991a) viewed maternal role attainment as having two components; the affective which refers to the mother's subjective feelings about her ability and the behavioral which involves her caretaking ability manifested in her actual behaviors. Maternal confidence was categorized as the affective component of maternal role attainment (Zahr, 1993). Role
competence was related to the knowledge an individual has of the maternal role and her perceived ability to acquire and demonstrate that role (Zahr, 1991a).

Mercer and Ferketich (1994a) defined maternal role competence as a mother's skills and interactions in the care of her infant that promote the infant's development. Maternal competence has been measured either by observers who rate maternal behaviors or by the woman's perceived competence in the role (Mercer, 1985). A mother's perception of her competence in the role reflects her maternal confidence, which is a basic determinant of her capacity as a mother and which affects her response to her infant (Mercer & Ferketich).

A mother's feelings of confidence in her ability to care for her infant is necessary for healthy adaptation to parenthood and a positive mother-infant relationship (Zahr, 1991a). A relationship has been demonstrated between mothers' positive affective perceptions of infants, and earlier timing of maternal identity recognition (Zabielski, 1994). Full term mothers who perceive themselves as confident in their parenting role rated their infants as less difficult in temperament (Zahr). Some research findings have indicated that mothers of preterm infants have a delayed recognition of maternal identity (Mercer, 1995; Zabielski, 1994) and lower confidence (Zahr) than mothers of fullterm infants. Zahr hypothesized that lower levels of maternal confidence could have negatively affected a mother's perception of her infant's temperament, especially in situations where the infant was difficult to engage as a role partner.

The link between maternal behavior and maternal confidence has not been supported. For example, Zahr (1991a) found no correlation between maternal confidence and maternal behaviors. A mother who performed the skills of parenting with apparent ease and comfort, may not have felt confident (Zahr, 1991a). Mercer (1985) found that teenagers were scored lower on observed maternal (competency) caretaking behaviors than older women, but felt more gratification in the role as mother, and had comparable feelings about the baby. This
may have been due to the role strain felt by older mothers and the different expectations held by the older mothers of their own mothering behavior.

Hall et al. (1997) examined the confidence of mothers who breastfed and formula fed their preterm infants. Although they found no significant difference between the groups in confidence there was a significant increase over time in confidence in both groups. The mothers’ confidence increased significantly, even up to two weeks after discharge. The authors point out this is important because it has been reported that mothers breastfeeding preterm infants have a profound vulnerability about their infants getting enough milk particularly during the first and second week following hospital discharge. They argued that if the breastfeeding mothers in this study were experiencing this vulnerability it would likely have resulted in lower confidence scores than the formula feeding mothers.

Factors Influencing Maternal Role Attainment

Maternal factors such as parity, age, education, and perceived support, as well as the infant characteristics and abilities as a role partner have all been found to affect maternal role attainment (Zabielski, 1994). Zahr (1991a) found that maternal confidence was positively correlated with mothers' age, prior childrearing experience, and years of education. Mercer (1985) studied the process of maternal role attainment in primiparas and also found that competency in role behavior increases with increasing age. Maternal identity recognition most commonly occurs as the mother assumes control of the care of the infant; in the case of parents of preterm infants control over care generally occurs after discharge from the hospital (Zabielski, 1994).

The importance of social support to maternal role attainment is discussed by several authors (Mercer, 1985; Reece, 1993; Rubin, 1984; Zahr, 1991b). Social support is generally considered to have a number of dimensions, including instrumental assistance, information provision, and emotional empathy and understanding (Crnic et al., 1983). Social support has
been thought to have both a buffering effect and a direct effect against stress (Younger, Kendall & Pickler, 1997). There are various types of social support, including spousal, personal, and professional. Each has an independent effect in the postpartum period (Younger et al.).

Crnic et al. (1983) examined the relationships of stress and social support to maternal attitudes and early mother-infant behavior in a sample of preterm and fullterm infants. There were no group differences, but stress and social support significantly predicted maternal attitudes at one month and interactive behavior at four months. The intimate support of the spouse/partner was shown to have the most general positive effects, and social support moderated the adverse effects of stress on mothers' life satisfaction and on several behavioral variables. This finding was not supported by Zarling, Hirsh, and Landry (1988) who found that social support was not significantly correlated with maternal sensitivity in a term or preterm group. Zarling et al. found that greater maternal sensitivity was associated with denser social networks in their fullterm sample, whereas greater maternal sensitivity was associated with a less tightly knit social network in the preterm sample. Moreover, there are mixed results regarding the effects of social support as a mediator of stress in the early postpartum period. Younger et al., (1997) found that social support was positively related to mastery and inversely related to depression in mothers of preterm infants, but Gennaro, Brooten, Roncoli, and Kumar (1993) found that social support was not related to the amount of anxiety or depression experienced by mothers of low birth weight infants.

The preterm infant is a very different role partner than the fullterm infant, and as such, affects the mother's role attainment (Zabielski, 1994). The infant's response to care acts as a source of a mother's confidence or uncertainty and has been related to a mother's perceived competence (Mercer & Ferketich, 1994a). Premature infants are unpredictable and less responsive than fullterm infants (Zahr, 1991a). Magyary (1984) suggested that preterm infants
are ill equipped to be competent social partners because they display minimal alertness, attentiveness, responsiveness, coordination, predictability, and consolability, which all require extra effort from their parents. They also provide less clear cues to their parents (Alfasi, et al., 1985). Following discharge, mothers of premature infants were less confident about caring for their infants than mothers of fullterm infants (Zahr). The birth and initial care taking of a preterm infant is likely to be stressful, and anxiety provoking for the parent and may erode parents' self-confidence in relation to being competent caregivers (Magyary).

Breastfeeding and Maternal Role Attainment

Klaus, Kennell, and Klaus (1995) described infant feeding as the beginning of intimacy between the parent and infant. Feeding is one of the most important caretaking behaviors demonstrated by a mother. A mother's perception of success with infant feeding is interpreted as her success as a mother (Virden, 1988). Breastfeeding success has been associated with enhancement of maternal role attainment and self esteem, and women who weaned earlier than planned have experienced negative effects including feelings of inadequacy, loss, disappointment, a sense of failure in attainment of the maternal role, and invalidation (Brandt, Andrews & Kvale, 1998). Isabella and Isabella (1994) found that mothers who adjusted well to pregnancy and motherhood tended to nurse their babies more exclusively in the first nine months of life.

Factors that affect maternal confidence and the recognition of maternal identity, such as maternal age, education, socioeconomic status, and social support, are similar to those that have been linked to increased initiation and duration of breastfeeding in the preterm and fullterm populations (Matthews, Webber, McKim, Barroub-Baddour & Laryea, 1998; Quarles, Williams, Hoyle, Bruneyer & Williams, 1994). Formation of maternal identity, confidence in mothering and successful breastfeeding all rely on the infant’s positive feedback and the mother’s ability to interpret that feedback accurately.
Social support has been identified as an important variable in the initiation and duration of breastfeeding. The social network has a role in shaping a mother's beliefs about the advantages and disadvantages of infant feeding methods (Kessler, Gielen, Diener-West & Paige, 1995; Littman, Medendorp & Goldfarb, 1994; Raj & Plichta, 1998). The interactions with the social network may be either positive or negative toward breastfeeding, and have been shown to affect both maternal confidence and duration of breastfeeding (Kessler et al.; Littman, et al.; Raj & Plichta). A father's support of breastfeeding is a significant predictor of initiation and duration. (Kessler et al.; Raj & Plichta). The mother and friends of the birth mother have also been reported to be an important source of support for breastfeeding (Littman et al.) in addition to lactation consultants, support groups, and medical personnel (Raj & Plichta).

Isabellla and Isabella (1994) found that the type of feeding-related support received by mothers varied depending on the source: husbands and (grand) mothers provided the greatest degree of emotional and instrumental support, while doctors and nurses provided more information, which was associated with success at establishing lactation. Kaufman and Hall (1989) found that women who chose to breastfeed their preterm infants reported greater influence from their social network than those choosing to bottle-feed. The duration of breastfeeding among those who chose to breastfeed was significantly associated with the number of supports. Women with no source of support were six times more likely to cease lactation than women with six sources of support.

As discussed earlier, the preterm infant is a less competent role partner and interactions between mother and infant can affect the quality of maternal role attainment. The characteristics of the infant that make interaction with the parent more difficult also have an impact on breastfeeding. Lothian (1995) described the important contribution of the infant to successful breastfeeding. In her study, infant satisfaction with breastfeeding (as evidenced by
sucking competence and contentment at the breast) was a key factor in breastfeeding duration. A premature infant generally has a weaker, less coordinated suck, has more difficulty remaining alert during feeds, and has more difficulty providing clear cues for hunger and satiety (Meier, Brown & Hurst, 1999).

Mothers of preterm infants have limited opportunity to perform maternal role actions such as feeding and caretaking in hospital (Zabielski, 1994). Such limitations affect the establishment of maternal identity and the mother may remain in the formal stage of maternal role attainment, where she is dependent on directives from professional experts (Mercer, 1995). The mother is hampered not only in getting to know her infant, but also in gathering the cognitive information needed to begin the informal maternal role stage behaviors of experimenting with what works best for her infant (Mercer, 1995). When a mother takes her preterm infant home from the hospital she rapidly assumes full caretaking responsibility and control. She may have had limited experience with breastfeeding while in hospital, but on discharge, must try to understand the cues of her preterm infant. The infant's cues may be difficult to discern. The challenging transition from breast and bottle feeding to primarily breastfeeding in the post discharge period is related to the confidence and competence of the mother, the quality of her social support, and the ability of her infant to breastfeed and provide clear cues for care.

**Summary**

The literature has illustrated the complexity of the transition from primarily bottle feeding to primarily breastfeeding in preterm infants, and the multiple factors that affect breastfeeding a preterm infant. The incidence and duration of breastfeeding in the preterm population has been low (Ehrenkranz et al., 1985; Hill, Anderson & Ledbetter, 1995; Hill, Brown & Harker, 1995; Lefebvre & Ducharme, 1989; Meier et al., 1993). There has also been apparent difficulty in the transition to breastfeeding from bottle-feeding for most mothers of
preterm infants (Kavanaugh et al., 1997; Kavanaugh et al., 1995). Research findings from third world countries was encouraging in that it showed that preterm infant of 30 to 34 weeks can breastfeed with virtually no medical intervention (Ramasethu et al., 1993). However, there is a lack of knowledge about breastfeeding patterns of preterm infants in the period following hospital discharge in Western countries (Hill et al., 1994; Hill et al., 1997; Meier et al., 1993). Knowledge about breastfeeding patterns has also been hampered by the lack of consistency in how breastfeeding is defined in research examining preterm infants (Hill, Anderson & Ledbetter, 1995; Hill et al., 1994; Hill et al., 1997).

Hill and her colleagues (1994;1997) studied the post-discharge breastfeeding patterns of 110 LBW infants. They utilized a modified version of the Labbok and Krasovec (1991) breastfeeding schema, which separated the amount of breastmilk given from the feeds directly at breast. This study was based on retrospective data gathered eight weeks after delivery to determine the pattern of breastfeeding at discharge, and four and eight weeks following discharge from hospital. These reports highlighted the low rate of full breastfeeding in this population, and recommended further research to refine the breastfeeding schema used in the study.

The qualitative research done by Kavanaugh and her colleagues highlight the concepts of maternal confidence, competence, and the interaction between the maternal and infant partners. Preterm infants have been less competent role partners as they are unpredictable and less responsive than full-term infants (Zahr, 1991a). Caring for a preterm infant initially can be stressful and anxiety provoking for the parent and may erode the parents' self-confidence in relation to being competent caregivers (Magyary, 1984). A mother's success with feeding her infant has been interpreted as her success as a mother (Virden, 1988). The ability to make the transition to full breastfeeding in the post discharge period is related to the confidence and
competence of the mother, the quality of her social support, and the ability of her infant to
breastfeed and provide clear cues for care.

Chapter Three will present the research method chosen to examine breastfeeding a
preterm infant in the four-week period after hospital discharge. The operational definitions,
research questions, sample, data collection procedures, and modes of analysis will be
described.
Chapter Three: Methods

This chapter presents the research design, operational definitions, research questions, hypotheses, sample and setting, a description of the original study from which the data were collected, procedure for this study, and modes of analysis.

Research Design

This ex post facto, descriptive-correlational study describes the breastfeeding patterns (breastmilk feeding and feeding modes) of preterm infants through a detailed examination of daily feeding diaries completed by the mothers of preterm infants following both mothers' and infants' discharge from hospital. The study is a secondary analysis of data that were originally collected for an experimental study examining perceived maternal confidence and competence in relation to test-weighing. The first two research questions presented in Chapter One are answered by a descriptive analysis of the breastfeeding patterns. Hypothesized relationships between these patterns and perceived maternal confidence and competence are then examined.

Operational Definitions

Breastfeeding patterns. The number of breastmilk feedings and feeds directly at breast that an infant receives over a period of time.

Breastmilk feedings. The amount of mother's milk received as categorized, with adaptation, in the schema proposed by Labbok and Krasovec's (1991). To assess the amount of breastmilk feeds versus formula feeds the frequency of the type of feed will be used to made the determination of the feeding pattern.

1. exclusively breastmilk fed (at breast or expressed mothers' milk feeds via bottle or supplemental nurser). This category requires 100% breastmilk, but because the statistical
software required a range, it has been represented as 99-100% breastmilk, however, the infants were not receiving any other forms of feeding.

2. primarily breastmilk fed between 98% and 80% breast milk feeds combined with less than 20% formula/solids feeds.

3. high partial with between 50% and 79% breastmilk feeds and the rest formula or solid feeds.

4. medium partial with between 20% and 49% breastmilk and the rest formula or solid feeds.

5. low partial with between 5% and 19% breastmilk feeds.

6. token or comfort feeds with 4% or less breastmilk feeds.

**Feeding mode.** The method by which the infant receives milk (mother's milk or formula); Feeding mode is reported as a proportion of feeds that occurred directly at breast, and is categorized in a similar way as breastmilk feeding. To assess the proportion of feeds directly at breast versus bottle feeds the frequency of the type of feed will be used to make the determination of the feeding mode.

1. exclusively breastfeeding. This category requires 100% of feeds directly at breast, but because the statistical software required a range, it has been represented as 99-100% breastfeeding, however, the infants were not receiving any other modes of feeding.

2. primarily breastfeeding with between 80% and 98% of feeds directly at breast combined with less than 20% bottle feeds.

3. high partial breastfeeding with between 50% and 79% of feeds directly at breast and the rest bottle feeds.

4. medium partial breastfeeding with between 20% and 49% feeds directly at breast and the rest bottle feeds.

5. low partial breastfeeding with between 5% and 19% of feeds directly at breast.

6. token or comfort feeds with direct feeds at breast occurring 4% of the time or less.
Maternal Confidence. Maternal perception of confidence as measured by Zahr's (1991a, 1993) Maternal Confidence Questionnaire, which was developed by Parker and Zahr (1985).

Maternal Competence. Maternal perception of her skill, knowledge, and values for good parenting, as measured by the 17 item Parental Sense of Competence Scale (Gibaud-Wallston & Wandersman, 1978).

Social support. Maternal perception of influence from her social network regarding breastfeeding, as measured by the Influence of Specific Referents Scale (ISR) (Kaufman, 1986).

Research Questions

The research questions are:

1. What are the weekly breastfeeding patterns (breastmilk feedings and feeding modes) of preterm infants who are 30-34 weeks gestation from the day of hospital discharge to four weeks post-discharge?

2. What are the relationships between breastmilk feedings and feeding modes at one, two, three, and four weeks post hospital discharge?

3. What are the relationships between the breastmilk feedings of preterm infants at one week and four weeks post hospital discharge and their mothers' confidence and competence.

4. What are the relationships between the feeding modes of preterm infants at one week and four weeks post hospital discharge and their mothers' confidence and competence.

Hypotheses

The hypotheses that address questions three and four:

1. Mothers of preterm infants who feed a larger proportion of breastmilk will have higher levels of perceived confidence and competence than do mothers who feed a smaller proportion of breastmilk to their preterm infants.
2. Mothers of preterm infants who feed directly from the breast for a larger proportion of feeds will have higher levels of confidence and competence than mothers of preterm infants who feed directly from breast for a smaller proportion of feeds.

Original Study

The research questions were addressed by conducting secondary analyses on data collected for an experimental study to determine the effectiveness of test weighing in a population of 30-34 week gestation infants (Hall & Shearer, unpublished research report). The purpose of the experimental study was to compare preterm infants who were routinely test weighed with those who were not test weighed during hospitalization to determine if there were any differences in outcomes in hospital and up to four weeks postdischarge. The outcomes that were compared included: weight gain; frequency of breastfeeds; breastmilk feeding (amount of supplementation and complementation with formula and/or expressed breastmilk); duration of breastfeeding; and maternal confidence and competence. The experimental treatment was not responsible for any significant differences between the groups on any of the listed outcomes. As a result, the determination was made that group assignment would not distort the investigation regarding the relationship between maternal confidence and competence and breastfeeding pattern and mode, and the entire sample could be used for the analysis.

Sample and Setting

The subjects were 60 women who gave birth at B.C. Women's Hospital, a large urban maternity hospital between February, 1996 and March, 1998, and who planned to breastfeed. Inclusion criteria for the experimental study were: having an infant between 30 to 34 weeks gestation, having a singleton or twin, residing in the Greater Vancouver Regional District, and having an infant lacking any facial or gastrointestinal congenital anomalies or identified syndromes. Infants and their mothers were excluded if their mothers intended to formula feed,
had a medical condition which precluded the initiation of breastfeeding such as drug addiction, ingested maternal medications that impact on neonates, or had infections that can be transmitted through breastmilk. The subjects were recruited at the earliest opportunity following admission to the level two nursery.

Consent

Informed consent was obtained from each woman who was recruited for the study. Permission for the study was received from the ethics committee of the University of British Columbia and research coordinating committee of B.C. Women's Hospital. Permission for secondary analysis of the data was obtained through the University of British Columbia Behavioral and Social Sciences Ethics Committee (see Appendix A) prior to any examination of the data.

Data Collection Procedures

At the time of recruitment and before randomization to one of the two groups, mothers completed the Demographic Data Sheet, Maternal Confidence Questionnaire, Parental Sense of Competence Measure, and the Influence of Specific Referents Scale. While in hospital, data were collected daily regarding infants' feeding, specifically number of breastfeeds, bottle-feeds, gavage feeds, supplementation and complementation, and weight gain from flow sheets that comprised part of the infant's chart. Measures of the mothers' levels of confidence, competence, and support were obtained immediately preceding the infant's discharge from hospital. Mothers were given a specially designed and standardized diary to document feeding practices (breastfeeding patterns and duration, and supplementation or complementation), episodes of infant and maternal illness at home, and instructions about how those data were to be documented.

Home visits were completed weekly for the four weeks following the infant's discharge from hospital. During those home visits, one of three nurses obtained the infant's
weight, length, and head circumference and collected the maternal feeding diary. At the first home visit, post-discharge demographic questions and the measures of confidence, competence, and social support were completed. The measures of confidence, competence, and social support were repeated at week four. The final feeding diaries were collected at the fourth home visit.

**Instruments**

**Feeding diaries.** Standardized maternal diaries were completed to document the number of daily breastfeeds and bottle-feeds, volume of supplementation per feed, duration of breastfeeding up to four weeks, and incidents of infant or maternal illness (Hall & Shearer, unpublished research report). The diaries included charts that had pre-existing columns to facilitate mother's description. Space was provided to document incidents of infant or maternal illness because of their potential negative effect on the feeding process. Similar types of data were collected by mothers during a study on milk intake and growth in term infants (Butte, Garza, O'Brian Smith, & Nichols, 1984). These researchers found that the mothers provided very accurate and complete data in relation to their infants. The study population was primarily middle to upper class with a range of ethnic and educational backgrounds.

**Parental Sense of Competence Scale.** Perceived maternal competence was measured by the 17 item Parental Sense of Competence Scale (Gibaud-Walston & Wandersman, 1978). This scale was designed to measure self-esteem in parenting, which was defined as the cognitive outcome of a self-evaluation process (Mercer & Ferketich, 1994a). It measures the parents' perceptions of their skill, knowledge, and values for good parenting (Mercer, Ferketich, & DeJoseph, 1993). The items are measured on a six point, Likert type scale where the respondent is asked the degree of agreement or disagreement with a statement. The measure contains two scales. The first scale reflects the extent that a parent feels he or she has acquired
the necessary skill and understanding for good parenting; the second assesses a parent's perception of the value attached to the parenting role and the comfort associated with parenting (Hall & Shearer, unpublished research report).

The instrument has been used in several studies (Herrmann, Van Cleve, & Levison, 1998; Mercer et al., 1993; Mercer & Ferketich, 1994a; Mercer & Ferketich, 1994b) including a longitudinal study of high risk and low risk antenatal women and their partners (Mercer & Ferketich, 1994a), experienced and inexperienced mothers (Mercer & Ferketich, 1994b), and adolescent mothers (Herrmann et al., 1998). The instrument has been used with a large sample, 121 high risk and 182 low risk women, who were followed from 24 to 34 weeks gestation until eight months after delivery (Mercer & Ferketich, 1994a). Data were collected during hospital stay, then at one, four, and eight months postpartum. Internal consistencies ranged from .82 to .87 (Mercer & Ferketich, 1994a). In a study comparing maternal-infant attachment of 136 experienced (one or more previous children) and 166 inexperienced mothers, Mercer and Ferketich (1994b) found significant relationships between maternal competence and maternal attachment at one, four, and eight months postpartum. Their finding supports Rubin's (1984) hypothesis that maternal competence and maternal attachment are interdependent and is evidence that contributes to construct validity (Mercer & Ferketich, 1994a; Mercer & Ferketich, 1994b).

Maternal Confidence Questionnaire. Perceived maternal confidence was measured by Zahr's (1991a, 1993) Maternal Confidence Questionnaire, which was developed by Parker and Zahr (1985) for mothers of preterm infants. The questionnaire consists of 14 items that measure maternal perceptions of confidence in parenting skills and ability to recognize her baby's needs. These items are answered on a five point Likert type scale. The items on the scale were derived from the clinical expertise of the authors and based on selected caretaking behaviors of mothers that were found in similar scales (Zahr, 1991a), including the Parental Sense of
Competence Scale (Gibaud-Walston & Wandersman, 1978). The measure was designed for ease of application with low-income, disadvantaged mothers, to include items related to maternal understanding of their infants, and to be applicable to premature infants (Zahr, 1991a). Reported alpha coefficients have ranged from .88 to .89 (Zahr, 1991a, 1993). The measure has demonstrated some convergent validity because significant correlations ($r = .53$, $p < .05$) were found with the Parental Sense of Competence Scale (Zahr, 1991a). Zahr (1991a) used the instrument to measure the confidence of preterm mothers, and with mothers from low socioeconomic backgrounds, and Latina mothers of low birth weight infants (Zahr, 1993).

Influence of Specific Referents Scale. Perceived social support was measured by the Influence of Specific Referents Scale (ISR) (Kaufman, 1986). This scale was developed with the preterm population to measure a mother's perception of influence from her social network. The ISR contains seven items about the perceived wishes of specific referents and is scored on a seven point scale, for example, referent "thinks I should not breastfeed" (−3) to the referent is neutral (0) to referent "thinks I should breastfeed" (+3). The referents are: baby's father, own mother, closest friend, own doctors, baby's doctors, own nurses, and baby's nurses. Another series of seven items measures a mother's willingness to comply with the perceived wishes of each named referent. These are scored on a seven point scale from not at all (1) to very much (7). A total ISR score is obtained by summing the series of cross products of paired items (referent wishes multiplied by motivation to comply). When a referent score was neutral, the cross product was zero and did not contribute to the total score. Cronbach's alpha that indicated internal consistency of the scale was .86. When the total ISR score was used to predict breastfeeding versus formula feeding mothers, the score was a significant predictor of feeding-group membership (Kaufman & Hall, 1989). When the ISR score and the covariates were used, 97% of cases were correctly classified. Both sensitivity and specificity estimates were high, 98 and 94% respectively (Kaufman & Hall).
Procedure for this Study

The data from the test-weighing study were provided to the author in electronic form following receipt of ethical approval. Demographic data from the mothers and infants, daily number of breastfeeds, bottle feeds of EMM, and bottle feeds of formula were provided by the transcriber of the data from the feeding diaries completed by the mothers. Scores on the maternal confidence, parental competence, and social support scales and total scores were provided to the author by the statistical consultant.

SPSS Graduate Pack for the Macintosh, version 6.1 was the software package used to create the data sets and complete the statistical analysis. The statistical analysis was planned in consultation with a statistical consultant who assisted this author in selecting appropriate statistical tests for the analysis and interpreting the results.

Two data sets were created for examination. The infant data included the infant demographic information (gender, birthweight, gestational age, twin status, and length of hospital stay) and the determination of weekly breastfeeding pattern (breastmilk feeding and feeding mode). The maternal data set included demographic information (mother's age, cultural identity, level of education, family income, and parity), weekly breastfeeding pattern (breastmilk feeding and feeding mode) classification based on the categories described in the operational definitions, and scores on the maternal confidence, parental competence, and social support scales completed on weeks one and four. Coding sheets were developed by the author for the maternal and infant data sets (see Appendix B).

The feeding diary data were examined week by week, and information entered onto the infant coding sheet (see Appendix B). The proportion of breastmilk feeding was determined by summing the number of feeds directly at breast and the number of feeds of breastmilk and dividing by the number of feeds of artificial milk for the week. The resulting proportion of breastmilk feeds was then used to determine which category the infant was in.
for that week. The feeding mode was determined by summing the number of feeds directly at breast for the week and dividing by the total number of feeds (breast and bottle). The resulting proportion of feeds directly at breast was used to determine the weekly feeding mode category. Thus, for each infant there was a breastmilk feeding designation and feeding mode designation for each of the four weeks post hospital discharge.

Analysis

The proportion of breastmilk feeds and proportion of feeds directly at breast (raw numbers) for each subject for each week were entered into the SPSS (1995) statistical analysis software system. The data were examined to describe the demographic characteristics of the sample, the weekly mean proportion of breastmilk feeds, and weekly mean proportion of feeds directly at breast. The statistical software was used to categorize the data into the breastmilk feeding and feeding mode schema detailed in the operational definitions.

The relationship between breastmilk feeding and feeding mode was examined. A statistical correlation was not completed because of the high number of infants who received breastmilk exclusively. The relationship between provision of exclusive breastmilk in week one and the breastmilk feeding and feeding mode in the subsequent weeks was examined instead. Relationships between breastmilk feeding and feeding mode and demographic characteristics (in particular twin status and length of hospital stay) were examined using analysis of variance (ANOVA). Differences in breastmilk feeding and feeding mode from week to week were examined using repeated measures ANOVA.

The breastmilk feeding and feeding modes provided the investigator with criterion groups, which were compared on levels of maternal confidence and competence. A factorial analysis of covariance using breastmilk feeding and feeding mode as the independent variables, social support as the covariate, and maternal confidence and competence as the
dependent variables was planned to be used to determine the relationship amongst the variables at two different time points, one week and four weeks post discharge.

ANCOVA was designed for experimental studies with random assignment and experimental control, and under these circumstances it enhances the precision of the statistical analysis (Owen & Froman, 1998). However, using intact or pre-existing groups can reduce statistical power. In this study, the subjects were self-selecting into breastmilk feeding and feeding mode groups. Owen and Froman (1998) discussed two assumptions that assist the researcher to decide if ANCOVA is appropriate. The first assumption was that the covariate is uncorrelated with other independent variables. Prior to using ANCOVA the correlation between breastmilk feeding and feeding mode and the covariate support was determined and there was no correlation. The second assumption was that the covariate was correlated with the dependant variables. In order to test this assumption, correlation coefficients were examined between support and confidence and competence, and no correlation was found. Because the second assumption was not supported a multivariate analysis of variance (MANOVA) was used in place of the ANCOVA (Shavelson, 1996).

Multivariate analysis of variance is useful in exploratory designs that determine the effects of independent variables on more than one dependent variable (Davis & Robinson, 1995). The MANOVA F-test provides the measure of significance between groups, which provides a test of group differences across the dependent variables for a given probability of significance (.05 in this study) (Davis & Robinson, 1995).

The design requirements for a MANOVA include:

1. There were two (or more) independent variables with two or more levels.
2. The levels of the independent variable may differ qualitatively or quantitatively. In this study, the independent variables were the breastmilk feeding and feeding mode, both of which have levels that differed qualitatively.
3. A subject appeared in one and only one group in the design. In this study, the group assignment was not determined by the investigator (Shavelson, 1996). The assumptions for the MANOVA are similar to those of a two-way ANOVA which include:

1. Independence: An individual's scores on dependent variables were independent of the scores of all other subjects.

2. Normality: The scores within each cell of the design should be drawn from a population in which scores are normally distributed. Two-way ANOVA is robust to violation of the assumption of normality.

3. Homogeneity of variances: The variances of the scores in the populations underlying all the cells of the design are equal (Shavelson, 1996).

In consultation with the statistician it was determined that the assumptions were met adequately to ensure suitability of the MANOVA test for the analysis of the maternal confidence and competence scores in relation to breastmilk feeding and feeding mode. The limitations of the statistical analysis will be described in Chapter Five.

Summary

This chapter presented research design, operational definitions, research questions, hypotheses, sample and setting, a description of the original study from in which the data were collected, procedure for this study, and modes of analysis. An ex post facto, descriptive-correlational design was used to describe the breastmilk feeding and feeding modes of preterm infants through a detailed examination of daily feeding diaries completed by the mothers of preterm infants following both mothers' and infants' discharge from hospital. The relationships between breastmilk feeding and feeding modes, and maternal confidence and competence were also examined. In Chapter Four the results of the data analysis are presented.
Chapter Four: Results

The results of the ex post facto, descriptive-correlational study describing the breastmilk feeding and feeding modes of preterm infants were obtained through a detailed examination of daily feeding diaries completed by the mothers of preterm infants following both mothers' and infants' discharge from hospital. This study examines the proportion of breastmilk and breastfeeds infants received from hospital discharge to four weeks post-discharge.

Following a description of the demographic statistics of the sample, the results that addresses the research questions in Chapter Three will be discussed. The first question was "What are the weekly breastfeeding patterns (breastmilk feeding and feeding modes) of preterm infants (30-34 weeks gestation) from day of hospital discharge to four weeks post-discharge?", and the second question was "What is the relationship between breastmilk feedings and feeding modes at one week, two weeks, three weeks and four weeks post-discharge?" Breastmilk feeding (proportion of breastmilk feeds an infant receives) and feeding mode (proportion of feeds directly at the breast) are examined separately, then the relationship between them is described. In addition, the breastmilk feeding and feeding mode of twins in the sample is contrasted with that of singletons. Finally, the relationship between breastmilk feeding and feeding mode, and maternal confidence and competence is examined through inferential statistics.

Description of the Sample

The original sample of mothers included 40 primiparas and 20 multiparas (Hall & Shearer, unpublished research report). Of these 60 participants, 53 completed the feeding diaries and questionnaires in the post-discharge period. The loss of seven participants did not
change the demographic profile. The mean age of the women was 32.7 years (SD=4.1, range 23-41). The level of education was high with 64.2% having completed a post secondary degree. The income levels varied, and the self-identified cultural identity of the sample was diverse (see Table 1).

Table 1
Maternal Characteristics (N=53)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>(% of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural Identity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arab</td>
<td>1</td>
<td>(1.9%)</td>
</tr>
<tr>
<td>Asian</td>
<td>6</td>
<td>(11.3%)</td>
</tr>
<tr>
<td>Canadian</td>
<td>32</td>
<td>(60.4%)</td>
</tr>
<tr>
<td>Caribbean</td>
<td>1</td>
<td>(1.9%)</td>
</tr>
<tr>
<td>Chinese</td>
<td>7</td>
<td>(13.2%)</td>
</tr>
<tr>
<td>European</td>
<td>3</td>
<td>(5.7%)</td>
</tr>
<tr>
<td>South/Central American</td>
<td>1</td>
<td>(1.9%)</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>(3.8%)</td>
</tr>
<tr>
<td>Level of Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some High School</td>
<td>1</td>
<td>(1.9%)</td>
</tr>
<tr>
<td>High School Grad</td>
<td>18</td>
<td>(33.0%)</td>
</tr>
<tr>
<td>College Grad</td>
<td>11</td>
<td>(20.8%)</td>
</tr>
<tr>
<td>University Grad</td>
<td>19</td>
<td>(35.9%)</td>
</tr>
<tr>
<td>Post Grad Degree</td>
<td>4</td>
<td>(7.5%)</td>
</tr>
</tbody>
</table>

Table 1 continues
Table 1 continued

Maternal Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>(% of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Income in Canadian Dollars</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 30,000</td>
<td>5</td>
<td>(9.4%)</td>
</tr>
<tr>
<td>30,000-59,000</td>
<td>17</td>
<td>(32.1%)</td>
</tr>
<tr>
<td>60,000-89,000</td>
<td>2</td>
<td>(22.6%)</td>
</tr>
<tr>
<td>90,000-109,000</td>
<td>9</td>
<td>(17.0%)</td>
</tr>
<tr>
<td>More than 110,000</td>
<td>10</td>
<td>(18.9%)</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primiparous</td>
<td>36</td>
<td>(67.9%)</td>
</tr>
<tr>
<td>Multiparous</td>
<td>17</td>
<td>(32.1%)</td>
</tr>
</tbody>
</table>

In the original study, there were 75 infants. Of the 75 infants there was post-discharge feeding data on 66 infants. Again, the loss of participants did not change the demographic profile of the sample. As shown in Table 2, the majority of the infants (54.5%) were 34 weeks gestation. Birth weight ranged from 1120 to 2945 grams, with 6.1% considered very low birth weight, 68.2% low birth weight, and 25.8% above 2500 grams. Most of the infants were appropriate weight for gestational age. There were 13 sets of twins, which accounted for almost 40% of the study sample. Male infants made up over 60% of the sample.
Table 2

Infant Characteristics (N=66)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>(% of sample)</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>40</td>
<td>(60.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>26</td>
<td>(39.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birthweight</td>
<td></td>
<td></td>
<td></td>
<td>2203 g</td>
</tr>
<tr>
<td>0000-1499 grams</td>
<td>4</td>
<td>(6.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1500-1999 grams</td>
<td>13</td>
<td>(19.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000-2499 grams</td>
<td>32</td>
<td>(48.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2500-3000 grams</td>
<td>17</td>
<td>(25.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gestational Age</td>
<td></td>
<td></td>
<td>33.7 w</td>
<td>0.9 w</td>
</tr>
<tr>
<td>30 weeks</td>
<td>1</td>
<td>(1.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 weeks</td>
<td>5</td>
<td>(7.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33 weeks</td>
<td>16</td>
<td>(24.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 weeks</td>
<td>36</td>
<td>(54.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 weeks</td>
<td>8</td>
<td>(12.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twin Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singletons</td>
<td>40</td>
<td>(60.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twins</td>
<td>26</td>
<td>(39.4%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table continues
Table 2 continued

**Infant Characteristics**

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>(% of sample)</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length of Stay</strong></td>
<td></td>
<td></td>
<td>9.1</td>
<td>5.2</td>
</tr>
<tr>
<td>3-5 days</td>
<td>6</td>
<td>(24.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-8 days</td>
<td>23</td>
<td>(34.9%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-11 days</td>
<td>10</td>
<td>(15.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-14 days</td>
<td>9</td>
<td>(13.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-18 days</td>
<td>0</td>
<td>(0.0%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19-24 days</td>
<td>8</td>
<td>(12.1%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Weight Categorized by Gestational Age**

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>(% of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>6</td>
<td>(9.1%)</td>
</tr>
<tr>
<td>Appropriate</td>
<td>56</td>
<td>(84.8%)</td>
</tr>
<tr>
<td>Small</td>
<td>4</td>
<td>(6.1%)</td>
</tr>
</tbody>
</table>

**Note.**

Large for gestational age infants were above the 90\(^{th}\) percentile for weight, appropriate for gestational age infants were between the 10\(^{th}\) and 90\(^{th}\) percentile for weight, and small for gestational age infants were less than the 10\(^{th}\) percentile for weight (Neeson & May, 1986).

The length of hospital stay was relatively short with 59.1% of the infants staying in hospital eight days or less, and there was a large standard deviation of 5.2 days. As shown in
Table 3, there was similarity in the gestational age of infants regardless of the length of stay groups. All had an average of 33-34 weeks gestation. There is a significant difference in birth weight between the groups ($F(4, 61) = 5.18, p = .001$), with smaller infants in the longer stay group (over 15 days). The most plausible reason for the longer length of stay is that infants who stayed over 15 days in hospital were transferred to community hospitals near their homes; those in community hospitals appeared to have longer lengths of stay than those who remained in the tertiary care hospital.

Table 3

<table>
<thead>
<tr>
<th>Length of Stay in Days</th>
<th>n</th>
<th>Gestational Age</th>
<th>Birthweight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean weeks (SD)</td>
<td>Mean grams (SD)</td>
</tr>
<tr>
<td>5 days or less</td>
<td>16</td>
<td>33.6 (.62)</td>
<td>2364 (380)</td>
</tr>
<tr>
<td>6-8 days</td>
<td>23</td>
<td>34.0 (.67)</td>
<td>2361 (308)</td>
</tr>
<tr>
<td>9-11 days</td>
<td>10</td>
<td>33.8 (.92)</td>
<td>2142 (433)</td>
</tr>
<tr>
<td>12-14 days</td>
<td>9</td>
<td>33.0 (1.41)</td>
<td>2124 (427)</td>
</tr>
<tr>
<td>15 days or more</td>
<td>8</td>
<td>33.4 (.92)</td>
<td>1703 (365)</td>
</tr>
</tbody>
</table>

Breastfeeding Pattern: Breastmilk Feeding

The breastmilk feeding was determined by the percentage of feeds the infant received that were breastmilk as opposed to an artificial baby milk. The amount of breastmilk the infant received in a week was estimated by adding the number of breastfeeds and the number
of EMM bottle-feeds then by dividing total number of feeds (breastfeeds and bottle-feeds of EMM and formula) in the week (see coding sheets in Appendix B). This resulted in a percentage of feeds that were breastmilk. As a group, the infants were fed breastmilk most of the time. The mean percent of breastmilk received by the group of infants changed very little over the four weeks from 87.9% to 88.9%. The data were then classified into the categories described by Labbok and Krasovec (1991) and examined week by week. The categories included: exclusively breastmilk (at breast or EMM via bottle or supplemental nurser); primarily breastmilk fed with greater than 80% breast milk combined with less than 20% formula/solids; high partial with between 80% and 50% breastmilk and the rest formula or solids; medium partial with between 49% and 20% breastmilk and the rest formula or solids; low partial with less than 20% breastmilk; and token or comfort feeds.

There is very little variability from week to week for the different categories (see Table 4). In the first week post-discharge 40 (60.6%) infants received breastmilk exclusively. At week two, the number of infants receiving breastmilk exclusively was 39 (59.1%). At week three, 37 (56.1%) infants received breastmilk exclusively, and 39 (59.1%) infants for week four. The change in percentage from week one to four reflected the loss of one baby from the exclusive breastmilk group. The primarily breastmilk fed category (80-98%) stayed relatively stable with a slight increase in numbers in week three. The high partial category (50-79%) dropped steadily until week four when there was a slight increase in the numbers. The medium partial category (20-49%) rose during weeks two and three, but stayed quite low. The low partial category (5-19%) stayed stable.
Table 4

**Amount Of Breastmilk Given Weeks One To Four.**

<table>
<thead>
<tr>
<th>Breastmilk Category</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Exclusive: 99-100%</td>
<td>40 (60.6%)</td>
<td>39 (59.1%)</td>
<td>37 (56.1%)</td>
<td>39 (59.1%)</td>
</tr>
<tr>
<td>Primarily: 80-98%</td>
<td>7 (10.6%)</td>
<td>10 (15.2%)</td>
<td>13 (19.7%)</td>
<td>8 (12.1%)</td>
</tr>
<tr>
<td>High Partial: 50-79%</td>
<td>13 (19.7%)</td>
<td>10 (15.2%)</td>
<td>7 (10.6%)</td>
<td>9 (13.6%)</td>
</tr>
<tr>
<td>Med. Partial: 20-49%</td>
<td>1 (1.5%)</td>
<td>3 (4.5%)</td>
<td>5 (7.6%)</td>
<td>2 (3.0%)</td>
</tr>
<tr>
<td>Low Partial: 5-19%</td>
<td>2 (3.0%)</td>
<td>1 (1.5%)</td>
<td>0 (0.0%)</td>
<td>2 (3.0%)</td>
</tr>
<tr>
<td>Token: &lt;5%</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Not reported</td>
<td>3 (4.5%)</td>
<td>3 (4.5%)</td>
<td>4 (6.1%)</td>
<td>6 (9.1%)</td>
</tr>
</tbody>
</table>

**Note.** Breastmilk category is based on the percent of breastmilk given in the week.

**Exclusive versus Non-exclusive Breastmilk Feeders in Week One**

Given the high level of exclusive breastmilk feeding in week one, it was decided to compare infants who were exclusively breastmilk fed in the first week after hospital discharge with those who received some artificial milk in that first week home (see Table 5).
Table 5

Comparison of Exclusive Breastmilk Feeders in Week One and Non Exclusive Breastmilk Feeders in Week One Across Remaining Weeks.

<table>
<thead>
<tr>
<th>Group</th>
<th>Breastmilk Category</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Exclusive Breastmilk (a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exclusive: 99-100%</td>
<td>40 (100%)</td>
<td>36 (90.0%)</td>
<td>32 (80.0%)</td>
<td>32 (80.0%)</td>
</tr>
<tr>
<td></td>
<td>Primarily: 80-98%</td>
<td>0 (0%)</td>
<td>4 (10.0%)</td>
<td>6 (15.0%)</td>
<td>5 (12.5%)</td>
</tr>
<tr>
<td></td>
<td>Not reported</td>
<td>n/a</td>
<td>0 (0.0%)</td>
<td>2 (5.0%)</td>
<td>3 (7.5%)</td>
</tr>
<tr>
<td>Not exclusive Breastmilk (b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exclusive: 99-100%</td>
<td>0 (0%)</td>
<td>2 (8.7%)</td>
<td>4 (17.4%)</td>
<td>6 (26.1%)</td>
</tr>
<tr>
<td></td>
<td>Primarily: 80-98%</td>
<td>7 (30.4%)</td>
<td>6 (26.1%)</td>
<td>7 (30.4%)</td>
<td>3 (13.0%)</td>
</tr>
<tr>
<td></td>
<td>High Partial: 50-79%</td>
<td>13 (56.5%)</td>
<td>10 (43.5%)</td>
<td>7 (30.4%)</td>
<td>9 (39.1%)</td>
</tr>
<tr>
<td></td>
<td>Med. Partial: 20-49%</td>
<td>1 (4.3%)</td>
<td>3 (13.0%)</td>
<td>5 (21.7%)</td>
<td>2 (8.7%)</td>
</tr>
<tr>
<td></td>
<td>Low Partial: 5-19%</td>
<td>2 (8.7%)</td>
<td>1 (4.3%)</td>
<td>0 (0.0%)</td>
<td>2 (8.7%)</td>
</tr>
<tr>
<td></td>
<td>Not reported</td>
<td>n/a</td>
<td>1 (4.3%)</td>
<td>0 (0.0%)</td>
<td>1 (4.3%)</td>
</tr>
</tbody>
</table>

Note. Breastmilk category is based on the percent of breastmilk given in the week.

(a) Group composed of 40 infants who were exclusively breastmilk fed in week one. None of the infants received less than 80% breastmilk during the study period.

(b) Group composed of 23 infants who were not exclusively breastmilk fed in week one. Three infants had data missing for week one therefore were not included in this analysis.
The amounts of breastmilk given to the infants were stable over the four weeks post discharge, with little movement between the groups. Of the 40 infants who were exclusively fed breastmilk in the first week, none received less than 80% breastmilk during the four weeks data were reported. Moreover, 31 of the 40 infants received exclusively breastmilk for the four week period. Of the 23 infants who received less than 99% breastmilk in the first week, only six (26%) were receiving exclusively breastmilk by the fourth week, and only nine (39%) were able to give more than 80% breastmilk by week four.

The two groups (exclusively breastmilk fed in week one versus not exclusively breastmilk fed in week one) were examined to see if there were any demographic differences between them. A significant difference was found in the length of hospital stay, with those exclusively fed breastmilk ($M = 10.5$) having hospital stays significantly longer than those not exclusively breastmilk fed ($M = 7.2$, $F[1, 61] = 6.52$, $p = .01$). A significant difference was also found in gestational age (exclusively breastmilk fed infants $[M = 33.6]$, not exclusively breastmilk fed $M = 34.0$, $F[1, 61] = 3.93$, $p = .05$). There were trends approaching significance in twins (with more twins in the non-exclusively breastmilk fed group, $F[1, 61] = 3.10$, $p = .08$), and family income (with a lower family income in the non-exclusively breastmilk fed group, $F[1, 49] = 3.23$, $p = .08$). There were no significant differences between the groups in birth weight, cultural identity, parity, maternal age, or mother's level of education.

**Breastmilk Feeding Patterns by Length of Hospital Stay**

As discussed in the description of the sample, the difference in length of hospital stay was examined more closely to identify the characteristics of the infants at the various lengths of stay (see Table 3). The infants who were discharged earlier tended to have heavier birth weights than those staying longer. The infants staying 15 days or longer were significantly smaller with a mean weight of 1703 grams than the total sample ($F[4, 61] = 5.19$, $p = .001$).
Because a significant difference was found between the exclusive breastmilk fed infants in week one versus the not exclusively breastmilk fed infants in week one, a closer examination of the rates of breastmilk feeding for the different length of stay groups was completed (see Table 6). The results were bimodal, with the infants having the shortest (less than 5 days) and longest (over 15 days) lengths of stay receiving the highest average amounts of breastmilk at weeks one and four. The standard deviations for the length of stay groups from 6 to 14 days was large, indicating that there was a wide range of numbers of breastmilk feeds for the infants in those groups.

Table 6
Breastmilk Feeding of Infants at Different Lengths of Hospital Stay

<table>
<thead>
<tr>
<th>Length of Stay in Days</th>
<th>Breastmilk Feeds</th>
<th>Week 1</th>
<th>Mean % (SD)</th>
<th>Week 4</th>
<th>Mean % (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 or less</td>
<td>Breastmilk Feeds</td>
<td>93.6</td>
<td>(9.1)</td>
<td>93.1</td>
<td>(13.2)</td>
</tr>
<tr>
<td>6-8</td>
<td>Breastmilk Feeds</td>
<td>81.2</td>
<td>(26.3)</td>
<td>86.5</td>
<td>(24.8)</td>
</tr>
<tr>
<td>9-11</td>
<td>Breastmilk Feeds</td>
<td>80.3</td>
<td>(28.9)</td>
<td>76.9</td>
<td>(33.8)</td>
</tr>
<tr>
<td>12-14</td>
<td>Breastmilk Feeds</td>
<td>91.5</td>
<td>(15.5)</td>
<td>87.7</td>
<td>(18.8)</td>
</tr>
<tr>
<td>15 or more</td>
<td>Breastmilk Feeds</td>
<td>100</td>
<td>(0.0)</td>
<td>98.4</td>
<td>(3.2)</td>
</tr>
</tbody>
</table>
Breastmilk Feeding Patterns by Twins versus Singletons

Twins represented a high proportion of the sample (approximately 40%). Each twin was analyzed as an individual infant. As shown in Figure 1, twins received significantly fewer breastmilk feeds than singletons (at week one twins $[M = 78.4]$, singletons $[M = 93.5]$, $F[1, 58] = 12.33, p = .001$). The number of breastmilk feeds given to twins decreased over the four week study period, whereas the number of breastmilk feeds given to singletons increased in weeks three and four (interaction effect of twin by weeks $F[3, 3, 174] = 2.58, p = .055$).

![Figure 1: Percentage of Breastmilk Given: Twins versus Singletons](image)

When the data were classified into categories, the twin pattern was very different from that of the singletons. In particular, the proportion of exclusive breastmilk feedings and primarily breastmilk feedings was less in the twins than the singletons (see Table 7). In weeks one and two of the study, the number of twins receiving exclusively breastmilk feeds was 12 infants out of 26. This drops to nine in week three, and eight in week four. The number of twins receiving primarily or exclusively breastmilk feeds remained steady at 14 for the first three weeks then declined to 12 in week four.
Table 7.
Comparison of Breastmilk Feeding Between Singletons and Twins.

<table>
<thead>
<tr>
<th>Group</th>
<th>Breastmilk Category*</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Singletons: N = 40</td>
<td>Exclusive: 99-100%</td>
<td>28 (70.0%)</td>
<td>27 (67.5%)</td>
<td>28 (70.0%)</td>
<td>31 (81.6%)</td>
</tr>
<tr>
<td></td>
<td>Primarily: 80-98%</td>
<td>5 (125%)</td>
<td>8 (20.0%)</td>
<td>8 (20.0%)</td>
<td>4 (10.0%)</td>
</tr>
<tr>
<td></td>
<td>High Partial: 50-79%</td>
<td>5 (12.5%)</td>
<td>3 (7.5%)</td>
<td>4 (10.0%)</td>
<td>2 (5.0%)</td>
</tr>
<tr>
<td></td>
<td>Med. Partial: 20-49%</td>
<td>1 (2.5%)</td>
<td>2 (5.0%)</td>
<td>0 (0.0%)</td>
<td>1 (2.5%)</td>
</tr>
<tr>
<td></td>
<td>Low Partial: 5-19%</td>
<td>2 (5.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td></td>
<td>Token: &lt; 5%</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td></td>
<td>Not reported</td>
<td>1 (2.5%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>2 (5.0%)</td>
</tr>
<tr>
<td>Twins: N = 26</td>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td></td>
<td>Exclusive: 99-100%</td>
<td>12 (46.2%)</td>
<td>12 (46.2%)</td>
<td>9 (34.6%)</td>
<td>8 (30.8%)</td>
</tr>
<tr>
<td></td>
<td>Primarily: 80-98%</td>
<td>2 (7.7%)</td>
<td>2 (7.7%)</td>
<td>5 (19.2%)</td>
<td>4 (15.4%)</td>
</tr>
<tr>
<td></td>
<td>High Partial: 50-79%</td>
<td>8 (30.8%)</td>
<td>7 (26.9%)</td>
<td>3 (11.5%)</td>
<td>7 (26.9%)</td>
</tr>
<tr>
<td></td>
<td>Med. Partial: 20-49%</td>
<td>0 (0.0%)</td>
<td>1 (3.8%)</td>
<td>5 (19.2%)</td>
<td>1 (3.8%)</td>
</tr>
<tr>
<td></td>
<td>Low Partial: 5-19%</td>
<td>2 (7.7%)</td>
<td>1 (3.8%)</td>
<td>0 (0.0%)</td>
<td>2 (7.7%)</td>
</tr>
<tr>
<td></td>
<td>Token: &lt; 5%</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td></td>
<td>Not reported</td>
<td>2 (7.7%)</td>
<td>3 (11.5%)</td>
<td>4 (15.4%)</td>
<td>4 (15.4%)</td>
</tr>
</tbody>
</table>

Table continues.
Table 7 continued

Comparison of Breastmilk Feeding Between Singletons and Twins.

Note

Breastmilk category is based on the percent of breastmilk feeds given in the week.
Percentages are calculated for singletons and twins as separate groups.

Singletons received a higher rate of breastmilk feeds than twins. The number of singletons receiving exclusively breastmilk feeds increased from 28 out of 40 infants in week one to 31 infants in week four. The number of singletons receiving over primarily breastmilk feeds also increased slightly over the four week period from 33 in week one to 35 in week four. There was a much larger percentage of twins receiving 50-79% breastmilk feeds than singletons. Overall, only one or two singletons received less than 50% breastmilk feeds whereas up to five twins received less than 50% breastmilk feeds.

In week three several interesting changes occurred. For singletons, all of the infants received 50% or more breastmilk feeds, and the number receiving exclusive breastmilk feeds increased in week four. The twins however, showed a trend in the opposite direction. There was a drop in the number of twin infants who received exclusive breastmilk feeds and an increase from two infants to five who received less than 50% breastmilk feeds. In week four, the decrease in breastmilk feeds continued.

Patterns of Breastfeeding: Feeding Mode

The feeding mode describes how the infant was fed, either at the breast or by bottle. The mothers in the study recorded every breastfeed and bottle-feed given. For bottle-feeds, the mothers specified amounts and whether it was EMM or formula. The data were examined to determine the proportion of feeds directly at breast. This was estimated by dividing the
number of breastfeeds in a week by the total number of feeds (breastfeeds and bottle-feeds). There was considerably more variability in the percentage of feeds at breast than in percentage of breastmilk feeds.

![Figure 2: Feeds Directly at Breast Weeks One to Four](image)

The data were classified into the categories described by Labbok and Krasovec (1991) and examined week by week (see Figure 2 and Table 8). The categories are: exclusively breastfeeding, primarily breastfeeding with 80% to 98% of feeds directly at breast combined with less than 20% bottle feeds, high partial breastfeeding with between 50% and 80% feeds directly at breast and the rest bottle feeds, medium partial breastfeeding with between 20% and 49% feeds directly at breast and rest the bottle feeds, low partial breastfeeding with 55 to
19% of feeds directly at breast, and token or comfort feeds with less than 5% of feeds directly at breast. This analysis provided a clearer picture of the frequency of direct breastfeeding in this population.

Table 8

Percent of Feeds Directly at Breast Weeks One to Four.

<table>
<thead>
<tr>
<th>Feeding Mode</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusive: 99-100%</td>
<td>2 (3.0%)</td>
<td>5 (7.6%)</td>
<td>9 (13.6%)</td>
<td>15 (22.7%)</td>
</tr>
<tr>
<td>Primarily: 80-98%</td>
<td>12 (18.2%)</td>
<td>19 (28.8%)</td>
<td>20 (30.3%)</td>
<td>18 (27.3%)</td>
</tr>
<tr>
<td>High Partial: 50-79%</td>
<td>10 (15.2%)</td>
<td>11 (16.7%)</td>
<td>10 (15.2%)</td>
<td>8 (12.1%)</td>
</tr>
<tr>
<td>Med. Partial: 20-49%</td>
<td>29 (43.9%)</td>
<td>18 (27.3%)</td>
<td>12 (18.2%)</td>
<td>11 (16.7%)</td>
</tr>
<tr>
<td>Low Partial: 5-19%</td>
<td>8 (12.1%)</td>
<td>4 (6.1%)</td>
<td>8 (12.1%)</td>
<td>3 (4.5%)</td>
</tr>
<tr>
<td>Token: &lt; 5%</td>
<td>3 (4.5%)</td>
<td>8 (12.1%)</td>
<td>5 (7.6%)</td>
<td>8 (12.1%)</td>
</tr>
<tr>
<td>Not reported</td>
<td>2 (3.0%)</td>
<td>1 (1.5%)</td>
<td>2 (3.0%)</td>
<td>3 (4.5%)</td>
</tr>
</tbody>
</table>

Note. Feeding mode category is based on the proportion of feeds that occur at the breast as opposed to a bottle.

At the time of discharge from hospital only two infants were exclusively fed directly at breast. One infant was born at 33 weeks gestation, was large for gestational age weighing 2690 at birth, and stayed in hospital for six days (approximately 34 weeks gestation at discharge). The other infant was a twin born at 34 weeks gestation, was appropriate for
gestational age weighing 1850 grams and stayed in hospital for 18 days (approximately 37 weeks gestation at discharge). The other twin was fed directly at breast 98.2% of the time in that first week.

Twenty-nine infants (43.9%) were fed directly at breast between 20 and 49% of the time during week one. Some mothers in the first week were breastfeeding eight times a day and offering a complement of EMM or formula after every feed, so that in one day, 16 feeding episodes were recorded. Mothers with twins were also feeding in a similar pattern. In the second week the total number of feeding episodes decreased with an increase in breastfeeding and a decrease in bottle-feeds, indicating a movement toward more feeding directly at breast.

From the raw data it appears that a small number of mothers (approximately seven) stopped giving the complementary feeds abruptly and went on a breastfeeding "blitz" in week two or three. The pattern prior to the blitz was four or five breastfeeds per day with complementary bottle-feeds, and during the blitz they breastfed ten to twelve times a day with no bottle-feeds. It is unknown if this was the result of professional advice or a mother's own desire to stop bottle-feeding. Approximately half of the mothers who blitz fed were successful in exclusively breastfeeding. The other half of the group either returned to their previous pattern or decreased the amount of breastfeeding.

The increase in breastfeeding is gradual over the four-week period with no definite week in which infants were switched to more exclusive breastfeeding. By week four, 50% of the sample was exclusively or primarily breastfeeding, as opposed to 21.2% at week one. Over the four-week study period the number of infants exclusively or primarily fed directly at breast increased and the number fed directly at breast less than 50% of the time decreased. The number of infants fed directly at breast 50-79% of the time ranged between 8 and 11. It is important to note that the actual infants in this category may have been different each week as
infants progressed from feeding directly at breast less than 50% of the time to more frequent feeds at breast.

Fifteen infants (22.7%) were exclusively breastfed by the fourth week post discharge. No complementary bottles were given in the entire week to that group. A further 18 infants (27.3%) were primarily breastfed in week four. Being primarily breastfed involved receiving from one to ten bottle-feeds per week. By Labbok and Krasovec's (1991) categories, 33 infants (50%) were exclusively or primarily fed at breast by the end of the study period.

**Characteristics of Infants Receiving over 80% of Feeds Directly at Breast**

The characteristics of the infants who were exclusively or primarily fed directly at breast during week four were examined using one way ANOVAs. There were no significant differences in gestational age, length of hospital stay, birth weight, family income, mother's level of education, cultural identity, parity, or maternal age between those exclusively or primarily fed directly at breast, and those fed less than 79% of the time directly at breast. Although the differences were not significant, the rates of direct feeds at breast were examined for the different length of hospital stay groups (see Table 9). The infants with the shortest (less than 5 days) length of stay had the highest average number of feeds directly at breast in weeks one and four. The standard deviations for all of the length of stay groups was large, indicating that there was a wide range of numbers of direct feeds at breast for the infants in all of the groups. There were significant differences found between twins and singletons, F (1, 61) =13.84, p =.0004 and whether or not the infants received breastmilk exclusively in week one, F (1, 58) =12.44, p=.0008. These differences are described in more detail in the following section.
Table 9

Feeding Mode of Infants at Different Lengths of Hospital Stay

<table>
<thead>
<tr>
<th>Length of Stay in Days</th>
<th>Feeding Mode (Feeds directly at breast)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Week 1</td>
</tr>
<tr>
<td></td>
<td>Mean % (SD)</td>
</tr>
<tr>
<td>5 days or less</td>
<td>60.3 (31.2)</td>
</tr>
<tr>
<td>6-8 days</td>
<td>42.4 (27.5)</td>
</tr>
<tr>
<td>9-11 days</td>
<td>33.3 (23.9)</td>
</tr>
<tr>
<td>12-14 days</td>
<td>49.2 (36.0)</td>
</tr>
<tr>
<td>15 days or more</td>
<td>58.9 (33.8)</td>
</tr>
</tbody>
</table>

Relationship Between Exclusive Breastmilk Feeds in Week One and Feeds Directly at Breast

The group was then divided into infants who were fed exclusively breastmilk in week one and those not fed 100% breastmilk in week one (see Table 10). This was done to see the effect of the establishment of an adequate milk supply in the early weeks of the infant's life on the tendency to feed directly at breast in the longer term. Those infants who were fed breastmilk exclusively in week one generally increased the proportion of feeds directly at breast by week four. In contrast, those not exclusively breastmilk fed at week one showed less tendency to increase feeds directly at breast by week four.
<table>
<thead>
<tr>
<th>Feeding Mode Category</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exclusive Breastmilk (a)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exclusive: 99-100%</td>
<td>2 (5.0%)</td>
<td>5 (12.5%)</td>
<td>6 (15.0%)</td>
<td>13 (32.5%)</td>
</tr>
<tr>
<td>Primarily: 80-98%</td>
<td>12 (30.0%)</td>
<td>16 (40.0%)</td>
<td>17 (42.5%)</td>
<td>12 (30.0%)</td>
</tr>
<tr>
<td>High Partial: 50-79%</td>
<td>7 (17.5%)</td>
<td>4 (10.0%)</td>
<td>6 (15.0%)</td>
<td>4 (10.0%)</td>
</tr>
<tr>
<td>Med. Partial: 20-49%</td>
<td>14 (35.0%)</td>
<td>11 (27.5%)</td>
<td>5 (12.5%)</td>
<td>5 (12.5%)</td>
</tr>
<tr>
<td>Low Partial: 5-19%</td>
<td>3 (7.5%)</td>
<td>1 (2.5%)</td>
<td>2 (5.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Token: &lt; 5%</td>
<td>1 (2.5%)</td>
<td>2 (5.0%)</td>
<td>2 (5.0%)</td>
<td>4 (10.0%)</td>
</tr>
<tr>
<td>Not reported</td>
<td>1 (2.5%)</td>
<td>1 (2.5%)</td>
<td>2 (5.0%)</td>
<td>2 (5.0%)</td>
</tr>
<tr>
<td><strong>Not exclusive Breastmilk (b)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exclusive: 99-100%</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>2 (8.7%)</td>
<td>1 (4.3%)</td>
</tr>
<tr>
<td>Primarily: 80-98%</td>
<td>0 (0.0%)</td>
<td>2 (8.7%)</td>
<td>3 (13.0%)</td>
<td>6 (26.1%)</td>
</tr>
<tr>
<td>High Partial: 50-79%</td>
<td>3 (13.0%)</td>
<td>5 (21.7%)</td>
<td>4 (17.4%)</td>
<td>4 (17.4%)</td>
</tr>
<tr>
<td>Med. Partial: 20-49%</td>
<td>13 (56.5%)</td>
<td>7 (30.4%)</td>
<td>7 (30.4%)</td>
<td>6 (26.1%)</td>
</tr>
<tr>
<td>Low Partial: 5-19%</td>
<td>5 (21.7%)</td>
<td>3 (13.0%)</td>
<td>4 (17.4%)</td>
<td>1 (4.3%)</td>
</tr>
<tr>
<td>Token: &lt; 5%</td>
<td>2 (8.7%)</td>
<td>6 (26.1%)</td>
<td>3 (13.0%)</td>
<td>4 (17.4%)</td>
</tr>
<tr>
<td>Not reported</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>1 (4.3%)</td>
</tr>
</tbody>
</table>

Table continues
Table 10 continued.

Comparison of Direct Breastfeeding in Exclusive Breastmilk feeders in Week One and Non-exclusive Breastmilk Feeders at Week One

Note.

Feeding Mode category is based on the proportion of feeds directly at the breast in the week.

(a) Group was composed of 40 infants who were exclusively breastmilk fed in week one.

   None of the infants received less than 80% breastmilk during the study period.

(b) Group was composed of 23 infants who were not exclusively breastmilk fed in week one.

Percentages are calculated for exclusive and not exclusive as separate groups.

Three infants had data missing for week one therefore were not included in this analysis.

At week one, there is a significant difference in the proportion of feeds directly at breast for the two groups (exclusively breastmilk fed group [M=62.4] versus non-exclusively breastmilk fed group [M=28.7], \( F [1, 58] =15.8, \ p <.000 \). There were also significant differences in the number of direct feeds at breast between the two groups over the four week period (interaction effect of breastmilk category by weeks, \( F [3, 3, 174] = 2.79, \ p =.04 \)).

Sixty-two percent of the infants exclusively fed breastmilk in the first week were exclusively or primarily breastfed at week four as compared to 30% of the group that was not fed breastmilk exclusively. More significantly, only one of the 24 infants in the non-exclusive breastmilk group was exclusively breastfed in week four as opposed to 13 of the 40 infants in the exclusive breastmilk group.
Feeding Mode Patterns of Twins versus Singleton Infants

The differences in percentage of feeds directly at breast between twins and singletons were examined. For singletons, there is a steady increase to more direct feeds at breast over the four-week period. Although the twins also showed an increase, it was not as great as the singletons. There was a significant difference between the percent of feeds at breast between the two groups (at week one twins $M=34.7$, singletons $M=58.7$, $F[1, 60] = 20.29, p < .000$).

As shown in Table 11, there is a larger increase in singletons exclusively or primarily fed directly at breast than twins over the four week period. In the first week, 53.8% of the twins and 37.5% of the singletons were breastfed 20-49% of the time. As discussed earlier, it is likely that the infants were being breastfed four to eight times per day and bottle fed seven to eight times a day. The percentage of twins exclusively breastfed at week four was less than for singletons, 15.4% and 27.5%, respectively. Two sets of twins, with gestational ages 33 and 34 weeks, were exclusively breastfed at week four and these infants had been breastfed over 80% of the time since the second week post-discharge. In the fourth week, over 30% (four sets of twins) were being breastfed less than five percent of the time. At that time, no singletons were breastfed that infrequently. Over the four-week study period, the number of twins who were breastfed less than 19% of the time remained stable at eight to eleven out of the 26 infants.
Table 11

Comparison of Direct Breastfeeding Between Singletons and Twins.

<table>
<thead>
<tr>
<th>Group</th>
<th>Feeding Mode Category</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Singletons: N = 40</td>
<td>Exclusive: 99-100%</td>
<td>1 (2.5%)</td>
<td>5 (12.5%)</td>
<td>9 (22.5%)</td>
<td>11 (27.5%)</td>
</tr>
<tr>
<td></td>
<td>Primarily: 80-98%</td>
<td>10 (25%)</td>
<td>15 (37.5%)</td>
<td>16 (40.0%)</td>
<td>16 (40.0%)</td>
</tr>
<tr>
<td></td>
<td>High Partial: 50-79%</td>
<td>9 (22.5%)</td>
<td>7 (17.5%)</td>
<td>6 (15.0%)</td>
<td>4 (10.0%)</td>
</tr>
<tr>
<td></td>
<td>Med. Partial: 20-49%</td>
<td>15 (37.5%)</td>
<td>9 (22.5%)</td>
<td>7 (17.5%)</td>
<td>7 (17.5%)</td>
</tr>
<tr>
<td></td>
<td>Low Partial: 5-19%</td>
<td>2 (5.0%)</td>
<td>2 (5.0 %)</td>
<td>1 (2.5%)</td>
<td>1 (2.5%)</td>
</tr>
<tr>
<td></td>
<td>Token: &lt; 5%</td>
<td>1 (2.5%)</td>
<td>1 (2.5%)</td>
<td>1 (2.5%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td></td>
<td>Not reported</td>
<td>2 (5.0%)</td>
<td>1 (2.5%)</td>
<td>0 (0.0%)</td>
<td>1 (2.5%)</td>
</tr>
<tr>
<td>Twins: N = 26</td>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td></td>
<td>Exclusive: 99-100%</td>
<td>1 (3.8%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>4 (15.4 %)</td>
</tr>
<tr>
<td></td>
<td>Primarily: 80-98%</td>
<td>2 (7.7%)</td>
<td>4 (15.4%)</td>
<td>4 (15.4%)</td>
<td>2 (7.7%)</td>
</tr>
<tr>
<td></td>
<td>High Partial: 50-79%</td>
<td>1 (3.8%)</td>
<td>4 (15.4%)</td>
<td>4 (15.4%)</td>
<td>4 (15.4%)</td>
</tr>
<tr>
<td></td>
<td>Med. Partial: 20-49%</td>
<td>14 (53.8%)</td>
<td>9 (34.6%)</td>
<td>5 (19.2%)</td>
<td>4 (15.4%)</td>
</tr>
<tr>
<td></td>
<td>Low Partial: 5-19%</td>
<td>6 (23.1%)</td>
<td>2 (7.7%)</td>
<td>7 (26.9%)</td>
<td>2 (7.7%)</td>
</tr>
<tr>
<td></td>
<td>Token: &lt; 5%</td>
<td>2 (7.7%)</td>
<td>7 (26.9%)</td>
<td>4 (15.4%)</td>
<td>8 (30.8%)</td>
</tr>
<tr>
<td></td>
<td>Not reported</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>2 (7.7%)</td>
<td>2 (7.7%)</td>
</tr>
</tbody>
</table>

Table continues
Table 11 continued

Comparison of Direct Breastfeeding Between Singletons and Twins.

Note. *Feeding Mode category is based on the proportion of feeds directly at the breast. Percentages are calculated for each group (twin or singleton) separately.

Maternal Confidence and Competence

The relationships among breastmilk feeding, feeding mode and maternal confidence and competence were examined to answer the following two research questions: 1) What are the relationships between the breastmilk feeding of preterm infants at one week and four weeks post-discharge and mothers' confidence and competence. 2) What are the relationships between the feeding modes of preterm infants at one week and four weeks post-discharge and mothers' confidence and competence. The hypothesis developed from the first question was that women who fed a larger proportion of breastmilk would have higher levels of confidence and competence than do woman who fed a smaller proportion of breastmilk. The hypothesis developed from the second question was that women who fed directly at breast for a larger proportion of feeds will have higher levels of confidence and competence than women who fed directly at breast for a smaller proportion of feeds.

To examine these relationships, a second data set was developed using the Maternal Data Work sheet (see Appendix B). For women who had twins, the percent breastmilk given and percent breastfeeding was determined by averaging the percent breastmilk given or percent breastfeeding for both twins at each week.
An analysis of covariance (ANCOVA) was to be performed with social support as the covariate. Prior to using the ANCOVA, a number of assumptions had to be tested. The first assumption was that the covariate social support was uncorrelated with the independent variables of breastmilk feeding and feeding mode. This assumption was upheld because there were no correlations found. The second assumption was that the covariate social support was correlated with the dependent variables confidence and competence. As the only correlation found was between social support and the parental competence/valuing comfort subsection in week one (p=.011) it was determined that the second assumption could not be upheld; therefore using ANCOVA was not appropriate. The repeated measures ANOVA was also rejected as there was movement between the groups of independent variables from week one to week four, and the relationship between the breastmilk feeding and feeding mode and maternal confidence and competence at the distinct time points was of primary interest. Thus, a multivariate analysis of variance (MANOVA) was selected as the statistical mode of analysis.

**Breastmilk Feeding Patterns and Maternal Confidence and Competence**

Once the data were analyzed, it was discovered that approximately 60% of the sample was exclusively breastmilk feeding for the four week study period. Three groupings of the data were tested for the analysis. In one grouping, mothers were divided into 99-100% (exclusively breastmilk fed) and 0-98% (non-exclusively breastmilk fed). In the second grouping, mothers were divided into 0-79% and 80-100% breastmilk fed, and, in the third grouping, the mothers were divided into 0-49%, 50-84%, 85-100% breastmilk fed. The cell sizes were examined to determine their adequacy for statistical analysis.
Multivariate analysis of variance (MANOVA) was conducted for the three proposed groupings of breastmilk feeding and the dependent variables: confidence and competence, (see Tables 12 and 13). It was decided to use the exclusive/non-exclusive breastmilk fed groups because of the significant differences found in the examination of the breastmilk feedings, especially in rates of breastfeeding. Moreover, the cell sizes were more equal and no cells had less than 10 subjects, which prevented violating assumptions associated with MANOVA.

Table 12

Week One Analysis of Variance of Exclusive versus Nonexclusive Breastmilk Feeders and Maternal Confidence and Competence

<table>
<thead>
<tr>
<th>Variable</th>
<th>0-98% Breastmilk Mean Score</th>
<th>99-100% Breastmilk Mean Score</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence</td>
<td>3.97</td>
<td>4.06</td>
<td>.52</td>
</tr>
<tr>
<td>Competence (Skills/knowledge)</td>
<td>34.06</td>
<td>36.82</td>
<td>4.24*</td>
</tr>
<tr>
<td>Competence (valuing/comfort)</td>
<td>40.94</td>
<td>43.64</td>
<td>2.75</td>
</tr>
<tr>
<td>Competence (Total score)</td>
<td>75.00</td>
<td>80.55</td>
<td>5.71*</td>
</tr>
</tbody>
</table>

Note. Univariate F-tests with (1,48) d. f. *p < .05.

Higher scores indicate higher levels of confidence and competence.
Table 13

Week Four Analysis of Variance of Exclusive versus Nonexclusive Breastmilk Feeders and Maternal Confidence and Competence

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-98% Breastmilk</td>
<td>99-100% Breastmilk</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean Score</td>
<td>Mean Score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confidence</td>
<td>4.15</td>
<td>4.24</td>
<td>.44</td>
<td></td>
</tr>
<tr>
<td>Competence (Skills/knowledge)</td>
<td>37.93</td>
<td>38.21</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>Competence (valuing/comfort)</td>
<td>43.57</td>
<td>45.03</td>
<td>.46</td>
<td></td>
</tr>
<tr>
<td>Competence (Total score)</td>
<td>81.50</td>
<td>82.59</td>
<td>.15</td>
<td></td>
</tr>
</tbody>
</table>

Note. Univariate F-tests with (1,46) d.f. *p < .05.

Higher scores indicate higher levels of confidence and competence. There were no significant differences in week four for any variable.

In week one, there were significant differences in competence between the exclusive and non-exclusive breastmilk groups. Competence was measured using two sub-scales, one measuring competence in skills and knowledge, and the other measuring competence in valuing and comfort. The sub-scale scores were combined to determine the total competence score. Mothers giving breastmilk exclusively had higher total scores for competence, and
higher scores in the skills and knowledge sub scale, but not significantly higher scores on the valuing and comfort subscale than those giving breastmilk and artificial milk (see Table 12). By week four, the differences in parental competence were no longer significant, and there was no significant differences in confidence (see Table 13).

Feeding Mode Patterns and Maternal Confidence and Competence

As shown in the descriptions of the feeding modes, the majority of the sample was both breastfeeding and bottle-feeding for the four-week study period. To accurately capture the diversity in feeding mode, percentage of feeds at breast were determined (as described earlier).

The data were then grouped in two different ways for the analysis: 0-49% breastfeeding or 50-100% breastfeeding; and 0-49% breastfeeding, 50-84% breastfeeding and 85-100% breastfeeding. The 0-49% and 50-100% breastfeeding grouping was chosen for reporting the MANOVA. The cell size was less than 10 in week four for the grouping with three categories, specifically the 50-84% category, which violated assumptions. When the data were tested using an ANOVA, the significant differences that will be described in the grouping with three divisions were maintained in the grouping with two divisions.

MANOVA was conducted for the two proposed groupings of feeding mode and the dependent variables confidence and competence. The results of the MANOVA for week one for the two-group analysis (0-49% and 50-100% breastfeeding) is shown in Table 14.
Table 14

Week One Analysis of Variance of 0-49% and 50-100% Direct Breastfeeding and Maternal Confidence and Competence

<table>
<thead>
<tr>
<th>Group</th>
<th>0-49% Breastfeeding</th>
<th>50-100% Breastfeeding</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
<td><strong>Mean Score</strong></td>
<td><strong>Mean Score</strong></td>
<td></td>
</tr>
<tr>
<td>Confidence</td>
<td>3.92</td>
<td>4.19</td>
<td>5.32*</td>
</tr>
<tr>
<td>Competence (Skills/knowledge)</td>
<td>35.04</td>
<td>36.96</td>
<td>2.26</td>
</tr>
<tr>
<td>Competence (valuing/comfort)</td>
<td>41.36</td>
<td>44.09</td>
<td>3.17</td>
</tr>
<tr>
<td>Competence (Total score)</td>
<td>76.50</td>
<td>81.04</td>
<td>4.24*</td>
</tr>
</tbody>
</table>

Note. Univariate F-tests with (1,49) d. f. * p < .05.
Higher scores indicate higher levels of confidence and competence.

There were significant differences in maternal confidence in both groupings (0-49% and 50-100% breastfeeding p = .025; 0-49%, 50-84% and 85-100%, p = .042), with the women in the 50-100% breastfeeding group significantly more confident than the women in the 0-49% breastfeeding group. There was also a significant difference, p = .045, in the parental competence in the 0-49% and 50-100% breastfeeding grouping, with the women in the 50-100% breastfeeding group scoring significantly higher on competence (total score) than the
women in the 0-49% breastfeeding group. This difference did not reach significance, \( p = .080 \), in the three breastfeeding grouping (0-49%, 50-84% and 85-100%). At week four there were no significant differences in confidence and competence (see Table 15) for either of the groupings.

Table 15

Week Four Analysis of Variance of 0-49% and 50-100% Direct Breastfeeding and Maternal Confidence and Competence

<table>
<thead>
<tr>
<th>Variable</th>
<th>0-49% Breastfeeding</th>
<th>50-100% Breastfeeding</th>
<th>( F )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence</td>
<td>4.13</td>
<td>4.27</td>
<td>1.09</td>
</tr>
<tr>
<td>Competence (Skills/knowledge)</td>
<td>38.26</td>
<td>38.26</td>
<td>.00</td>
</tr>
<tr>
<td>Competence (valuing/comfort)</td>
<td>44.20</td>
<td>44.11</td>
<td>.00</td>
</tr>
<tr>
<td>Competence (Total score)</td>
<td>82.47</td>
<td>81.74</td>
<td>.06</td>
</tr>
</tbody>
</table>

Note. Univariate F-tests with (1,48) D. F. * \( p < .05 \).

There were no significant differences in variable in week four. Higher scores indicate higher levels of confidence and competence.
Comparison of Maternal Confidence and Competence between Mothers of Twin and Singleton Infants

Examination of the breastfeeding patterns (breastmilk feedings and feeding modes) between twins and singletons showed significant differences. However, when the data were examined using one-way ANOVAs to determine differences in maternal confidence and competence between these groups, none were found at either week one or four.

Change over Time in Maternal Confidence and Competence

The data were also examined to determine if there were any differences over time in maternal confidence and competence (see Table 16).

Table 16

<table>
<thead>
<tr>
<th>Variable</th>
<th>Week 1</th>
<th>Week 4</th>
<th>Paired Differences</th>
<th>df</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confidence</td>
<td>4.04 (.44)</td>
<td>4.22 (.42)</td>
<td>- .18 (.25)</td>
<td>50</td>
<td>-5.16**</td>
</tr>
<tr>
<td>Competence: Skills/Knowledge</td>
<td>35.90 (4.59)</td>
<td>38.16 (5.19)</td>
<td>-2.25 (3.69)</td>
<td>50</td>
<td>-4.37**</td>
</tr>
<tr>
<td>Competence: Valuing/Comfort</td>
<td>42.59 (5.57)</td>
<td>44.00 (7.24)</td>
<td>-1.41 (7.60)</td>
<td>50</td>
<td>-1.33</td>
</tr>
<tr>
<td>Competence: Total Score</td>
<td>78.55 (8.10)</td>
<td>81.73 (8.83)</td>
<td>-3.18 (5.33)</td>
<td>50</td>
<td>-4.25**</td>
</tr>
</tbody>
</table>

Note. * p < .05. ** p < .01

Higher scores indicate higher levels of confidence and competence.
T-tests for paired samples were used to examine the differences in the three measures between week one and week four. There were significant increases in maternal confidence, the parenting competence skills/knowledge subscale, and parenting competence total score. There were no significant increases in the parenting competence valuing/comfort subscale.

**Summary**

The analysis revealed a picture of the breastmilk feedings and feeding modes of the preterm infants in the study. The infants in the study received a high proportion of breastmilk feeds with 60% (40 infants) receiving breastmilk exclusively for the first week. The mean percent of breastmilk feeds received by the group of infants changed very little over the four weeks from 87.9% to 88.9%. Of the infants who received breastmilk feeds exclusively in the first week, all received at least 80% breastmilk feeds for the four-week study period. Of the 23 (40%) infants who received less than 100% breastmilk feeds in week one, only six were receiving 100% breastmilk in week four. The only significant difference found between the two groups was length of hospital stay with the infants who had exclusive breastmilk feeds having a longer length of stay.

There was considerable variability in proportion of feeds that were at directly at breast as opposed to bottle-feeding. The number of feeds at breast increased steadily over the four-week period. In week one only two (3%) infants were breastfed exclusively, and by week four 33 infants (50%) were exclusively or primarily. The establishment of an adequate milk supply during hospitalization, as evidenced by the ability to provide breastmilk exclusively in the first week post discharge was shown to be an important factor in the amount of breastfeeding. Sixty-two percent of the infants receiving exclusively breastmilk feeds in the first week were exclusively or primarily breastfed at week four, as compared to 30% of the group who was not fed breastmilk exclusively. More significantly, only one of the 24 infants in the non-
exclusive breastmilk fed group was exclusively breastfed in week four as opposed to 13 of the 40 infants in the exclusive breastmilk fed group.

Length of hospital stay may to be related to both breastmilk feedings and feeding mode. There was great variability within the length of stay groups in both breastmilk feeding and feeding mode. Infants with the shortest length of stay had higher rates of breastmilk feeds and feeds directly at breast. Infants with the longest lengths of stay had higher rate of breastmilk feeds, but not high rates of feeds directly at breast.

There was a difference in the number of breastmilk feeds received by twins when compared to singletons. On the whole, twins received fewer breastmilk feeds than singletons. In singletons, the proportion of breastmilk feeds increased over the four-week period while the proportion of breastmilk given decreased for twins with the biggest drop occurring in the third week. Twins were also fed directly at breast less than singletons. The percentage of twins exclusively fed at breast at week four is less than for singletons (15.4% and 27.5% respectively). In the fourth week, over 30% (four sets of twins) were being breastfed less than five percent of the time while no singletons were breastfed that infrequently.

When the relationships between breastmilk feeding and feeding mode and maternal confidence and competence were examined there were significant differences in the first week after discharge that did not persist through the fourth week. In week one, there were significant differences in competence between the exclusive and non-exclusive breastmilk fed groups, with those mothers giving breastmilk feeds exclusively having higher levels of competence than those giving breastmilk and artificial milk. Mothers who fed directly at breast more than half of the time were significantly more confident and competent in week one than those who did not feed directly at breast more than half of the time. Those differences did not retain significance in week four. Maternal confidence and competence increased significantly from week one to week four for the group as a whole.
The results presented in this chapter will be discussed in Chapter Five. Key findings that will be discussed include breastmilk feeding, feeding mode, length of hospital stay, twins, and maternal confidence and competence.
Chapter Five: Discussion

Breastfeeding a preterm infant is challenging, and there is much to learn about the process. In this study, detailed feeding diaries were kept by 53 mothers for their 66 infants. These diaries were examined to gain a better understanding of the breastmilk feedings and feeding modes of the infants in the four weeks after hospital discharge. This chapter discusses the key findings that have been presented in Chapter Four regarding the sample, breastfeeding patterns (breastmilk feeding and feeding mode), length of hospital stay, twins, and maternal confidence and competence.

The use of feeding diaries provided an accurate and compelling perspective that would have been difficult to obtain through maternal recall of how feeds occurred. The patterns seen in the data, especially those that had not been anticipated would not have been accessible through interview or questionnaire. Examination of the feeding diaries provided data on breastmilk feeding and feeding modes that were then explored further in relation to demographic data including twins and length of hospital stay. Relationships among breastmilk feeding, feeding mode, and maternal confidence and competence were determined.

The feeding diaries contained very detailed information. When interpreting the findings it is important to acknowledge that the daily feeding diaries were summarized into weekly data for the purpose of the analysis. As a result, some of the more subtle changes in patterns seen in the daily data were lost. For example, when the mothers changed their pattern of feeding for one or two days as the mothers on a feeding blitz did, it may not have appeared any different in the weekly data. However, by summarizing the data week by week the process of feeding a preterm infant over time was illustrated.

The convenience sample of 53 mothers and their 66 infants was recruited from the Level II nursery in a large tertiary care hospital in Vancouver, British Columbia. The sample
was ethnically diverse in that 40% self-identified as other than Canadian. The sample also had a range of education and income levels with 35% of the sample having no post-secondary education, and approximately 40% having a family income of less than $60,000 annually.

The preterm infants in the study were healthy, and the majority (84.8%), were an appropriate weight for their gestational age. Because the sample was recruited based on gestational age, rather than birthweight, there was variability in that 6.1% were very low birth weight, 68.2% low birth weight, and 25.8% above low birth weight. This sample differs from most of the American studies that classified the infants based on their weight rather than gestational age (e.g., Furman et al., 1998; Hill et al., 1994). When this study is compared to other published studies, the differences in the composition of the sample need to be considered.

**Breastmilk Feeding Patterns**

The examination of the diaries revealed the pattern of breastmilk feeding for four weeks following hospital discharge. The women in the study provided high levels of breastmilk for their infants with almost 60% providing breastmilk exclusively for the four-week period. In general, their supply of breastmilk appeared to be stable over the study period. The ability to provide breastmilk exclusively in the first week post-discharge was found to be an important predictor of the breastmilk feeding and of the transition to feeding directly at breast.

The infants in the study received a high percentage of breastmilk with 60% (40 infants) receiving breastmilk exclusively for the first week. This finding is similar to Hill et al. (1997) who found that 55% of preterm infants born at 30 weeks to less than 34 weeks gestation and 48% of preterm infants born at 34 weeks to less than 37 weeks gestation received exclusively mother's milk on day of discharge. In Hill et al.'s study, the sample size was 20 infants born at 30 to less than 34 weeks gestation ($M = 32$ weeks) and 60 infants born
at 34 to less than 37 weeks gestation ($M = 35$ weeks). No other authors reported the amount of breastmilk the infant received at or near the time of discharge, reporting instead the percentage of mothers breastfeeding preterm infants.

In the literature, concerns have been expressed about the high percentage (30-70%) of mothers who discontinue breastfeeding before hospital discharge (Meier et al., 1993) and about the low percentage (55-58%) of woman who initiate lactation (Ehrenkranz et al., 1985; Lefebvre & Ducharme, 1989). In this study, all of the woman had decided to breastfeed, and all continued their breastfeeding efforts after hospital discharge. Even though the sample was made up of woman committed to breastfeeding, the high level of breastmilk given to the infants was a pleasant surprise.

The percent of breastmilk (87.9% to 88.9%) received by the group of infants changed very little over the four weeks. Of the infants who received breastmilk exclusively in the first week, all received at least 80% breastmilk for the four-week study period. Of the 23 infants (40%) who received less than 100% breastmilk in week one, only six were receiving 100% breastmilk in week four. This finding confirms Hill et al.'s (1997) findings that the preterm infants' breastmilk feeding was stable over the four-week period. In Hill et al.'s (1997) study, however, the data were retrospective. The participants were contacted at eight weeks and asked about the pattern of feeding at four weeks.

The stability of the amounts of breastmilk given over the four-week study period indicates that the milk supply established while the infant is in hospital is an important predictor for the longer term. Hill, Aldag, and Chatterton (1999) found that women who had an adequate milk supply (defined as pumping at least 3500 grams/week) at week two after birth also had an adequate supply at week five, whereas, of those who didn't have an adequate supply in week two, only 28% were able to achieve an adequate supply by week five. They
found that to achieve an adequate supply, women needed to express a minimum of six times a
day. In their study, the infants were less than 32 weeks and were not feeding at the breast.

In this study, two groups (exclusively breastmilk fed in week one versus not
exclusively breastmilk fed in week one) were examined to see if there were any demographic
differences between them. Significant differences were found in length of hospital stay, and in
gestational age. Clinically, the difference in gestational age may not be significant as all
length of stay groups had mean gestational ages between 33 and 34 weeks. A more detailed
examination of length of stay and breastmilk feeding revealed that infants with the shortest,
and the longest lengths of stay had the highest rates of breastmilk feeding.

**Feeding Mode Patterns**

Exploration of the feeding diaries provided an illustration of how the infants
progressed from primarily receiving breastmilk via a bottle to primarily feeding directly at
breast. The considerable variability in the rates of breastfeeding allowed for detailed
exploration of the factors associated with the transition to breastfeeding. The transition was a
gradual one that likely continued for weeks after the study period.

Breastfeeding a preterm infant is challenging as these infants generally have a weaker,
less coordinated suck, have more difficulty remaining alert during feeds, and have more
difficulty providing clear cues for hunger and satiety (Meier et al., 1999). In this study 60% of
the infants were discharged breastfeeding less than half of the time. The ability of the preterm
infant to suckle well at the breast is rarely a criterion for discharge now that hospital stays
have shortened (Hill et al., 1997). As a result most of the infants in this study, and in several
of the studies reviewed were discharged from hospital primarily bottle feeding breastmilk
(Furman et al., 1998; Hill et al., 1997; Lefebvre & Ducharme, 1989).

Comparison of the rates of breastfeeding in this study with other studies was hampered
by the variety of breastfeeding definitions used. In this study, however, the breastfeeding rates
appear to be within the range of those published in other studies. Only 2 of the 66 infants studied were exclusively breastfeeding in the first week post-discharge. Lefebvre and Ducharme (1989) found that 3% of the LBW infants were exclusively breastfed at hospital discharge, and 31% of the LBW infants were exclusively breastfed for any period of time. Hill et al. (1997) reported that, at hospital discharge, 20% of the preterm infants (30-<34 weeks) were exclusively breastfed, and 36% of the preterm infants 34 weeks to 37 weeks were exclusively breastfed.

By week four, 23% of the infants in this study were breastfeeding exclusively. Hill et al. (1997) found that only 20% of the preterm infants (30-<34 weeks) were exclusively breastfed at four weeks, and 45% of the preterm infants 34 to 37 weeks were exclusively breastfed at four weeks. In this study, the transition to breastfeeding occurred at home, and by week four of the study, half of the infants were breastfed over 80% of the time.

The breastfeeding rates reported here are lower than those reported by Kliethermes et al. (1999) who compared nasogastric (NG) supplementation to bottle supplementation in preterm infants transitioning to breastfeeding. Kliethermes et al. reported high rates of breastfeeding in the NG group with approximately 80% of the NG supplemented group fully breastfed on day three post discharge and approximately 40% of the bottle-fed infants fully breastfed on day three. At three months, the rates of breastfeeding exclusively for the NG supplemented group were approximately 58% and the bottle-fed group was approximately 25%. They attribute these high rates to a comprehensive preterm breastfeeding program.

There was a low rate of failure to breastfeed in this study, with 12% reporting that they breastfed less than 5% of the time in week four. This rate is lower than that reported by Lefebvre and Ducharme (1989) who found that 37% of LBW infants fed breastmilk failed to breastfeed directly. The rate is comparable to Hill et al. (1997) who found that three (15%) of the preterm infants (30 to less than 34 weeks gestation) were bottle fed breastmilk only at four
weeks, and one had been weaned. Of the preterm infants 34 to 37 weeks gestation, 1 out of 60
was bottle fed breastmilk only at four weeks, but 11 of 60 infants (18%) had weaned.

The women in this study would have had access to lactation consultant support in
hospital, and follow up by a community health nurse, who would not have specialized
knowledge in breastfeeding preterm infants, after discharge. The transition to breastfeeding,
therefore, occurred primarily at home without organized professional support. Kliethermes et
al. (1999) demonstrated that a comprehensive preterm breastfeeding program may result in
higher levels of breastfeeding in this population. The transition to breastfeeding in their study
occurred primarily in hospital with professional support. Length of stay is not reported by
Kliethermes et al. (1999), so it is not known if the infants in their study had a longer length of
stay than the infants in this study.

The establishment of adequate milk supplies during hospitalization, as evidenced by
the ability to provide breastmilk exclusively in the first week post discharge was shown to be
an important factor in the frequency of direct breastfeeding. Sixty-two percent of the infants
exclusively fed breastmilk in the first week were exclusively or primarily breastfed by week
four as compared to 30% of the group who was not fed breastmilk exclusively at week one.
More significantly, only one of the 24 infants in the non-exclusive breastmilk group was
exclusively breastfed in week four as opposed to 13 of the 40 infants in the exclusive
breastmilk group. The importance of establishing and maintaining an adequate milk supply
has been strongly supported in this study. While the link between having an adequate supply
and subsequent breastfeeding success is logical, no other studies have reported findings that
support this link. On the other hand, Kavanaugh et al. (1995) have stated that mothers were
concerned more about milk transfer than a lack of milk because they knew that they had a
good supply as a result of pumping.
The transition to full breastfeeding in this study was gradual over the four-week period. As there was a change from week three to week four, there is no reason to assume that the amount of breastfeeding would not continue to change for several more weeks. This finding does not support the results of Kavanaugh et al. (1995) who reported that there was a turning point at approximately two weeks post discharge where the mother became more confident in breastfeeding (the infant was getting enough milk from the breast) so the bottle feeds were discontinued or decreased. Many women in this study were still making the transition to more exclusive breastfeeding at week four and would likely still benefit from breastfeeding support.

Abrupt changes in feeding mode, such as was seen in the women who went on a breastfeeding "blitz" for one to two days, lead to a decrease in breastfeeding for approximately half of the clients who tried it. It was not known if the women stopped giving bottle feeds because of advice from a professional or because of their own desire to breastfeed exclusively. Preterm infants may be at risk for underconsumption of milk when breastfeeding exclusively, until they are approximately full-term corrected age (Meier et al., 1999). A sudden increase in number of feeds at breast may have led to decreased consumption of milk in some of the infants.

Factors Influencing Breastfeeding Patterns

In the analysis of the data, several factors were examined in relation to the breastfeeding patterns. Length of hospital stay, and whether or not the infant was a twin were found to be significantly related to breastfeeding patterns.

Length of Hospital Stay

In this study, length of stay was a significant factor in feeding pattern, but was not found to be a statistically significant factor in feeding mode. In the literature, length of stay has not been studied for its effect on breastfeeding preterm infants. However, Meier et al.
reported that in the United States preterm infants are typically discharged from hospital before their expected birth dates whether or not breastfeeding has been well established, whereas in Europe discharge may be several weeks longer as the infants are only discharged when weight gain on complete breastfeeding has been documented.

In this study, a statistically significant difference was found in breastmilk feeding pattern with infants exclusively fed breastmilk having hospital stays significantly longer than those not exclusively breastmilk fed. On closer examination, it was noted that the results were bimodal, with the infants having the shortest (less than 5 days) and longest (over 15 days) lengths of stay receiving the highest average amounts of breastmilk at weeks one and four. The infants with the shortest length of stay were likely not separated from their mothers for more than a day or two, and were probably discharged early because they fed well. Both of these factors positively influenced milk supply. The mothers of the infants who stayed in hospital for over two weeks appeared to have an opportunity to establish an adequate milk supply through pumping. The standard deviations for the length of stay groups from 6 to 14 days was large, indicating that there was a wide range of numbers of breastmilk feeds for the infants in those groups.

A more detailed examination of feeding mode and length of stay in this study revealed that those with the shortest length of hospital stay had the highest rates of feeds directly at breast. The infants with the longest lengths of stay had rates of direct feeds at breast that were comparable to the infants with lengths of stay from 6 to 14 days despite the fact that the infants with the longest length of stay were almost exclusively breastmilk fed. The comparisons of feeding mode should be interpreted with caution due to the large standard deviations that indicate that there was great variability within the groups.

In this study, rates of breastmilk feeding and feeds directly at breast were high among infants discharged when five days old and less. Presumably, infants who are ready for


discharge so soon after birth were likely to be physiologically stable and taking oral feeds well earlier than the average infant born at 33 or 34 weeks. Infants who were more able to breastfeed well in the first week may have been better at providing cues to the mother, and may have had stronger, more effective sucking abilities.

The infants who were discharged between six and eleven days had the lowest rates of breastfeeding, despite having similar gestational ages and birth weights to the other groups. It may have been that these infants were less able to provide good feeding cues and had less effective sucking abilities, and thus were slower to progress to full oral feeds (the criteria for discharge). They also had lower rates of breastmilk feeding.

The eight infants who were transferred to community hospitals and stayed in hospital for 19-24 days had high levels of breastmilk feeding, and relatively low levels of breastfeeding. These infants were smaller for their gestational age than the group as a whole and were more likely to be a twin. These infants would have had more experience with bottle feeding than the infants with shorter lengths of stay, as breastfeeding could only occur when the mother was visiting. As a result, these infants may have preferred the bottle to breast, and therefore have been less likely to breastfeed. The mothers may also have become comfortable with bottle-feeding during the hospitalization, and may have had concerns about the infant's ability to get enough by breastfeeding.

**Breastfeeding Pattern Among Twins**

Twins and higher order multiples are more likely to be born preterm (Gromada & Spangler, 1998), and as such make up a significant proportion of the preterm population. Twins accounted for approximately 40% of the study sample. As a group they received less breastmilk than singletons, and were breastfed less overall. As the breastmilk feeding and feeding mode results are significantly different for twins and singletons, closer examination of the separate groups was warranted. In Meier et al.'s (1999) recent chapter on breastfeeding
preterm infants, twins and multiples are not discussed. Other articles on the clinical aspects of breastfeeding preterm infants also omit discussion of twins and multiples (Black & Highlander, 2000; Stine, 1990; Walker, 1992).

The rates of breastfeeding for twins were not reported separately in any of the studies reviewed. Gromada and Spangler (1998) reported that the breastfeeding initiation rate for multiples appears to be similar to or even higher than that for singletons, but that reliable data were not available. In this study, the rates of breastmilk feeding and breastfeeding of the twins lowered the average rates for the study group as a whole. These differences may lead to underestimating the success in breastfeeding a preterm singleton when they are not addressed in studies.

The pattern of breastmilk feeding twins was very different than that of singletons. For the first three weeks, 54% of the twins received breastmilk primarily or exclusively, with a drop to 46% in week four. The percentage of singletons receiving breastmilk primarily or exclusively increased slightly over the four week period from 83% in week one to 91% in week four. There was a much larger percentage of twins receiving 50-79% breastmilk than singletons. The pattern of direct breastfeeding was also much different. The percentage of twins exclusively breastfed at week four was almost half that of singletons (15.4% and 27.5% respectively). Over 30% (four sets of twins) were being breastfed less than five percent of the time, as opposed to no singletons who were breastfed that infrequently. The number of twins who were breastfed less than 19% of the time remained relatively stable over the four-week study period at eight to eleven of the 26 infants.

In the third week, several interesting changes occurred. All of the singletons received over 50% breastmilk, and the number receiving exclusive breastmilk increased in week four. The twins in the sample showed a trend in the opposite direction. There was a drop in the number receiving exclusive breastmilk and an increase from two infants to five who received
less than 50% breastmilk. In examining the feeding mode, there were more extremes for the results in the twin data in the fourth week, with two sets of twins exclusively breastfed and four sets of twins who had effectively weaned to bottle.

The trend to lower amounts of breastmilk being given to twins, which started in the third week, may indicate that the mothers chose to give formula as opposed to continued pumping. The regimen of breastfeeding and pumping is strenuous for many women, and for mothers of twins it may be too difficult to maintain for a long period of time. The overall increase in breastfeeding concurrent with an overall decrease in breastmilk being given from week one to four may indicate that the mothers were choosing to concentrate on breastfeeding their twins, and giving supplementary bottles of formula. Mothers of twins may have different goals in regard to breastfeeding than mothers of singletons, particularly in relation to the importance of breastfeeding exclusively.

Maternal Confidence and Competence

The results from this study indicate that early success at breastfeeding has an influence on maternal confidence and competence. The finding that mothers who provided breastmilk exclusively, and those who breastfed more than half of the time were more confident and more competent in the first week after hospital discharge, supports the research hypothesis proposed in this study.

In the literature, breastfeeding success has been associated with enhancement of maternal role attainment and self-esteem (Brandt et al., 1998). Hall et al. (1997) examined the confidence of mothers who breastfed and formula fed their preterm infants and did not find any difference between the groups. In that study, groups were formed based on the mother's intention to breast or bottle feed prior to birth, in contrast to the woman in this study who all intended to breastfeed, but were doing so to greater and lesser degrees.
By the fourth week of the study, there was no difference between the groups, and all had increases in confidence and competence. This suggests that all of the mothers were relatively more comfortable with infant feeding (whether breastfeeding had met their expectations or not), and in the mothering role. Hall et al. (1997) also found that confidence increased significantly in the weeks following discharge.

In this study, length of hospital stay was a factor that influenced breastmilk feeding and feeding mode. The interaction between length of stay and maternal confidence and competence is not known. Zabielski (1994) examined the recognition of maternal identity in mothers of preterm infants, and found that mothers of preterm infants did not feel like mothers until they were allowed full contact with, and control of, their infant. This generally did not occur until after hospital discharge. Long hospital stays affect the establishment of maternal identity because the mother might remain in the formal stage of maternal role attainment, where she is dependent on directives from professional experts (Mercer, 1995). The mother is hampered not only in getting to know her infant, but also in gathering the cognitive information needed to begin informal maternal role stage behaviors of experimenting with what works best for her infant (Mercer, 1995). Therefore, length of hospital stay may have a negative impact on maternal confidence.

In the literature, preterm infants have been described as being a very different role partner than fullterm infants (Zabielski, 1994). Premature infants are unpredictable and less responsive than fullterm infants (Zahr, 1991a). Magyary (1984) suggested that preterm infants are ill equipped to be competent social partners because they display minimal alertness, attentiveness, responsiveness, coordination, predictability, and consolability, which all require extra effort from their parents. An infant’s response to care can act as a source of a mother’s confidence or uncertainty and has been related to a mother’s competence (Mercer & Ferketich, 1994a). The factors that make an infant a poor role partner, may also negatively impact the
success of breastfeeding. Therefore, it is possible that the association of breastfeeding success and maternal confidence and competence could be, in part, due to the infants' role in the mother-infant dyad.

Summary

The examination of breastmilk feeding patterns revealed important information regarding initiating and maintaining an adequate milk supply when feeding a preterm infant. It confirms the findings of the few studies that have examined breastmilk feeding in preterm infants separately from breastfeeding. The study findings indicated that women who had an adequate supply (were able to feed breastmilk exclusively) in the first week post-discharge were able to maintain that supply, but those who didn't have an adequate supply in the first week were unlikely to achieve that by week four, is very important clinically. The significance of looking at breastmilk feeding separately from breastfeeding in the preterm population was illustrated by this thesis.

The transition from primarily bottle-feeding to primarily breastfeeding for preterm infants is a complex process that has not been well researched. In this study, infants who were primarily bottle fed when discharged from hospital, and then made the transition to primarily breastfeeding at home were followed. This study provides information about this transition in healthy preterm infants between 30 and 35 weeks who did not receive any specialized professional follow up. Adequacy of the milk supply was a key factor in the successful transition.

In this study, length of hospital stay was a significant factor in breastmilk feeding, but was not found to be a statistically significant factor in feeding mode. In the literature, length of stay has not been studied for its effect on breastfeeding preterm infants. Infants with the shortest length of stay had higher rates of breastmilk feeding and the highest rates of feeds directly at breast. Infants with the longer lengths of stay had the highest average of breastmilk
feeding, but low rates of feeds directly at breast. Infants who stayed in hospital 6 to 11 days had the lowest rates of both breastmilk feeds and feeds directly at breast. An infant's experience with bottle-feeding in hospital may make the transition to breastfeeding more difficult. The study findings draw attention to the importance of studying breastfeeding patterns in hospital for their effects on breastfeeding.

The findings from this study indicate that the breastfeeding experience of twins and multiples differs from that of preterm singletons. The differences in breastmilk feeding and feeding mode between twins and singletons was an important finding that had not been reported in the literature reviewed. Moreover, in the author's limited clinical experience with mothers of twins, it is clear that breastfeeding these infants can be more challenging than breastfeeding a singleton. The lower rates of breastfeeding for these infants point to an area where more information is needed.

This study found that there was a relationship between breastmilk feeding and feeding mode, and maternal confidence and competence in the first week after hospital discharge. Mothers who were feeding breastmilk more, and had more feeds directly at breast were more confident and more competent than those who fed less breastmilk, and had fewer feeds at breast. Length of hospital stay and the infant's abilities to provide cues for care and feeding may be factors that influence the relationship between breastfeeding and maternal confidence and competence in the first week.

Chapter Six will present the limitations to the study. Implications for practice, education, administration and research based on the findings of this study will be discussed followed by the conclusions.
Chapter Six: Limitations, Implications, and Conclusions

This chapter begins with limitations of the study. The implications for practice, education, administration, and research follow the limitations. Finally, the conclusions of the study are presented.

Limitations

The generalizability of these findings may be limited by the following factors. The restricted gestational age of the sample (30 weeks to 34 weeks) and the healthy status of the infants in the sample limit the generalizability to infants who are similar to the infants under study. The sample was one of convenience consisting of women who were committed to breastfeeding and willing to participate in a lengthy research project. This may make the sample unrepresentative of the population of women breastfeeding preterm infants. Information about duration of breastfeeding was not known as the follow up concluded at four weeks post-discharge. There was no information about the amount of breastmilk produced through pumping, so the adequacy of milk supply was assumed if the infant received breastmilk exclusively.

The inclusion of twins in the sample can also be seen as a limitation. When both twins were included in the analysis of the infant data regarding breastfeeding pattern and feeding mode the effects of the feeding practices of the mothers of the twins may have diluted the successful breastfeeding practices of the singleton group. For the analysis of confidence and competence, the data from each twin was averaged to produce one score, which was then examined with the confidence and competence data. On the other hand, because twins represent a large proportion of preterm infants, the analysis of the differences between twins and singletons was possible, and those comparisons may have increased the generalizability of the findings.
Threats to internal validity include the possibility of missing data, interpretation of the feeding diaries when transcribed, and the compression of feeding data into weekly data. The calculation of the percent of breastmilk given versus artificial baby milk was estimated by adding the number of breastfeeds and number of EMM bottle-feeds then dividing by the total number of feeds in the week. The exact amount of breastmilk given was unknown, as volume of milk intake during a breastfeed was not known. This may have lead to a systematic over or under-estimate of milk taken. During coding of the data from the feeding diaries, every effort was made to calculate the percent breastmilk received and percent breastfeeding accurately.

The statistical analysis was completed with the assistance of a statistical consultant who approved the analysis plan (J. Berkowitz, personal communication, September 2000). A power analysis was not conducted as the data had already been collected and, therefore, no factors to improve power could be changed. There is a risk of a Type II error because of the small sample size (53 women and 66 infants), and the small cell sizes. The cell sizes ranged from 14 to 36 for the analysis of maternal confidence and competence. There was a risk of a Type II error in the analysis of the factors associated with feeding pattern and feeding mode (length of stay, birthweight, and gestational age) due to the small sample/cell sizes, and due to the variability in the sample, as evidenced by the large standard deviations noted.

A threat to the external validity is the unknown effect that the research assistants who were experienced neonatal nurses and who visited each week, had on mothers' breastfeeding practices. The participants in the study knew the nurses from their stay in hospital, and trusted their advice. Although the nurses were not supposed to give breastfeeding advice, it may have been difficult for them not to give information when asked directly. Completing the feeding diary may have had an impact on a mother's feeding plans and on advice given by professionals and others. The presence of the feeding diary provided the mother and the professionals involved with information that would not normally be available. In the author's
clinical experience, feeding diaries are occasionally recommended when information about the feeding pattern would help the nurse counsel the breastfeeding mother.

**Implications**

The breastfeeding of preterm infants has been based on tradition and experimentation (Lefrak-Okikawa & Meier, 1993). This study described the feeding patterns and feeding modes of preterm infants with gestational ages between 30 and 35 weeks, and explored factors that are associated with breastfeeding success. The results have implications for nursing practice, education, administration and further research.

**Implications for Practice**

Initiation of an adequate milk supply and the transition to feeding directly at breast are the two main areas of concern for the professional working with mothers of preterm infants. Mothers need support to start pumping early, and to continue pumping frequently until the infant is feeding directly at breast. A plan to combine pumping and breastfeeding during the transition to full breastfeeding that is realistic in terms of the time involved needs to be developed with every mother of a preterm infant. The mother should know that the transition to full breastfeeding is gradual, and may take several weeks depending on the feeding ability of her infant. Mothers of twins particularly need support as the demands of caring for two preterm infants are difficult. Development of a carefully thought out feeding plan, and frequent contacts with the mother to assist in modifying the plan, are crucial.

Establishing a stable milk supply is important clinically. The clinician can inform the mother of the importance of pumping in the early days to establish the supply for the infant. Developing opportunities for mothers to pump when they are visiting their infants in hospital may be an important intervention to assist busy and tired mothers to establish their milk supply. The clinician can evaluate in the first week if the mother has established an adequate milk supply and target interventions to those mothers who have not been able to establish one.
Intervention may include drug therapy, such as metoclopramide, combined with frequent stimulation of the breast by pumping at least six to eight times per day (Hill et al., 1999; Meier et al., 1999).

Milk supply appears to be one of the most important factors in the success of breastfeeding a preterm infant. Establishing an adequate milk supply needs to be balanced with providing the infant experience with breastfeeding. It may be more beneficial for the clinician to recommend the mother concentrate on pumping for the first several days to a week with less frequent breastfeeding attempts if the infant does not suckle effectively enough to extract milk. Once the milk supply has been established (one to two weeks according to Hill et al, 1999), efforts can be directed to making the transition from primarily bottle feeding to full breastfeeding. This view is supported by Meier et al. (1999) who stressed the importance of pumping, and to allow the mother to progress to full breastfeeding as she feels she and the infant are ready. They caution clinicians not to advise mothers of preterm infants as if they are breastfeeding a full term infant.

The study by Kliethermes et al. (1999) suggested that feeding an infant by nasogastric tube during the period before the infant is ready to fully breastfeed may prevent nipple confusion and difficulty with the preterm learning to breastfeed. However, given the short length of hospital stay of many preterm infants, such an approach may be untenable. Length of stay may have to be reevaluated in order to promote successful breastfeeding. In this study, longer lengths of stay were associated with less direct breastfeeding, possibly due to the infants being bottle-fed in hospital.

The transition from bottle-feeding and breastfeeding to primarily breastfeeding occurred at home after hospital discharge. Many early maternity discharge programs provide follow-up through home visiting (Bennett & Tandy, 1998; Brown & Johnson, 1998; Edwards, Mackay & Schweitzer, 1992; Williams & Cooper, 1996; York et al., 1997). These programs
have generally been focussed on "low risk" mother-infant pairs (Bennett & Tandy; Brown & Johnson). In Vancouver, the author is aware of a successful early discharge program for antenatal patients who are followed by experienced antenatal nurses. An early discharge program for preterm infants born between 30 and 35 weeks, in which the families are followed by nurses experienced with the specialized needs of these infants, may facilitate the transition to primarily breastfeeding. The nurses would be able to provide education and support to mothers in understanding infants' cues for care, and assistance in modifying feeding plans.

Clinicians who work with families at home, particularly community health nurses, are in a position to provide the breastfeeding support mothers need to progress to exclusive breastfeeding. The clinician can inform the mother that the transition to exclusive breastfeeding for a preterm infant is a gradual process that can take more than four weeks. This information may help the mother to set reasonable goals in terms of how fast her infant can progress to exclusive breastfeeding, and how long she may need to continue to pump. When developing a feeding plan with a mother, the clinician should avoid abrupt changes like stopping all bottle feeds at once. The progression to exclusive breastfeeding can occur as early as the first week, so the clinician needs to evaluate the feeding ability of each mother-infant pair individually when giving breastfeeding advice.

In this study, only half of the infants were able to make the transition to exclusive or primarily breastfeeding in the four weeks after hospital discharge, despite the fact that 71% were provided with breastmilk for more than 80% of the feeds. Many infants were being bottle fed breastmilk. Mothers need support and encouragement to make the transition to exclusive breastfeeding once the infant is physiologically ready to do so. The professional can help the mother recognize her infant's readiness to breastfeed, and support her in the process.
This study demonstrated the lower rates of both breastmilk feeding and feeding at the breast with twins. For mothers of preterm twins who are making the transition from bottle and breastfeeding to primarily breastfeeding, the time involved in both breastfeeding and supplementing after a feed becomes critical because their workload is effectively doubled. The advice for breastfeeding preterm twins should differ from the advice given for breastfeeding preterm singletons, because the goals and the concerns of the mother for feeding may be very different. The professional can help the mother to develop a feeding plan that is reasonable in terms of time required. The feeding plan may include more pumping and less breastfeeding attempts in the first one or two weeks to ensure an adequate milk supply is established. Clarification of the mother's long term feeding goals is important in developing the feeding plan.

Implications for Education

Nurses who work with mothers of preterm infants in hospital and in community need to understand how preterm infants make the transition to exclusive breastfeeding, and how various nursing practices affect breastfeeding. The two main groups of nurses who work with preterm infants are neonatal care nurses and community health nurses.

Nurses who work in the neonatal intensive care units often have post-basic training in the specialty. The post-basic course should provide the nurse with a broad understanding of how preterm infants learn to breastfeed. Neonatal nurses need to appreciate the importance the establishment of an adequate milk supply is to breastfeeding success. Preterm infants are more physiologically stable when breastfeeding as opposed to bottle feeding, and therefore may be able to make breastfeeding attempts before they are ready to bottle feed (Meier et al., 1999). The method by which supplementary feeds are given (NG versus bottle) may have a long term impact on breastfeeding success, and needs to be chosen carefully (Kliethermes et al., 1999). Mothers of preterm infants who are more confident, and feel more competent may
be more likely to be successful at breastfeeding, so nurses should encourage the mother to participate in the infant's care, and learn to read her infant's cues.

Community health nurses may not have specialized knowledge in breastfeeding preterm infants. In-service education for community health nurses should explain the gradual nature of the transition to breastfeeding, and emphasize the need for follow-up for four to six weeks after hospital discharge. Community health nurses need to understand the differences between breastfeeding a preterm and full term infant, particularly that the preterm infant may be at risk for underconsumption of breastmilk by exclusive breastfeeding (Meier et al., 1999), and that the mother may be very concerned that her infant is not getting enough (Kavanaugh et al., 1995). Examples of feeding plans for a preterm infant during the transition to breastfeeding may be helpful. At the same time, rigid advice about breastfeeding every two to three hour to avoid underconsumption may not be helpful.

Implications for Administration

Hospital policies, particularly regarding length of stay and method of supplementation of breastfeeding, can affect breastfeeding success for preterm infants. Breastfeeding rates at discharge and four weeks post discharge could be used as an outcome measure when reviewing hospital policies. More research is needed on length of stay before policies should be changed. The research available on nasogastric supplementation suggests that it may prevent failure to make the transition to exclusive breastfeeding.

With the shortened hospital stays, policies supporting breastfeeding in the community need to be developed and implemented. Support of breastfeeding preterm infants in the community could include a specialized early discharge program for preterm infants, subsidy of breast pump rental, lactation consultant support, and in-service education for community health nurses.
Implications for Research

This study adds to the small amount of research available on breastfeeding preterm infants after hospital discharge. Areas for further research include further development of the classification of breastfeeding for preterm infants, the transition from bottle and breastfeeding to primarily breastfeeding, the special needs of breastfeeding twins, the impact of length of hospital stay on breastfeeding, the role of maternal confidence and competence in the transition to breastfeeding, and the use of feeding diaries in research.

The lack of an accepted classification of breastfeeding for preterm infants severely hampers the ability to compare research results. Further research is needed to develop research-based criteria to classify breastfeeding for preterm infants. The modification of the Labbok and Krasovec (1991) breastfeeding schema by Hill et al. (1997) used in this study clearly portrays the difference between breastmilk feeding and breastfeeding. This is a key distinction in the preterm population. Further development of nomenclature to describe and classify breastfeeding in this population should build on the schema used in this study. Simplification of the language and decreasing the number of groupings may make the schema easier to use.

More research is needed about how preterm infants make the transition to exclusive breastfeeding. Stine (1990) suggested a protocol that did not include any bottle-feeding, where all complementary feeds were given by gavage feeding. Kliethermes et al. (1999) completed a randomized control trial of nasogastric tube supplementation of preterm infants undergoing the transition to breastfeeding. They found that those infants receiving the nasogastric supplements were more likely to be breastfeeding at discharge and at three days, three months and six months than the infants who were supplemented by bottle, without extending length of stay or other adverse side effects. This study was done with infants with gestational ages of 26 to 35 weeks, with a mean gestational age of 32 weeks, and the length of
stay was an average of 33 days, so they were generally a population of infants with lower gestational ages than the infants in this study. The transition to breastfeeding occurred in hospital with the daily assistance of professionals. This study is the only published randomized control trial of a breastfeeding intervention for preterm infants located, and more well designed studies like this one are needed.

Kliethermes et al. (1999) suggest a preterm breastfeeding protocol that describes how to determine the amount of supplementation. It is based on length of time the infant suckles at the breast and the quality of the suck and swallow observed. This is much different that what is proposed by Meier et al. (1999) who suggest that test weighing is the only accurate way to assess breastfeeding and determine the need for supplementation. In the original study from which this data were obtained, test weighing was compared to not test weighing and no difference was found between the groups on breastfeeding success (Hall & Shearer, unpublished research report). Research is needed on how supplementation decisions are made, and their impact on breastfeeding.

There is increasing technology associated with breastfeeding preterm infants. For example, Meier et al. (2000) reported that milk transfer can be significantly improved with the use of an ultrathin silicone nipple shield, and that nipple shield use does not decrease the duration of breastfeeding. Randomized control trials are needed that compare mothers who are using technological approaches and those who are not, particularly with infants of moderate prematurity.

Few research studies of breastfeeding twins could be located, and one study that was found that dealt specifically with breastfeeding preterm twins was a case study (Biancuzzo, 1994). Much of the literature on breastfeeding twins and higher order multiples are based on case study and reports of clinical practice that are based on clinical experiences (e. g. Gromada & Spangler, 1998). Research is needed on the special needs of this group of
preterm infants as the rate of multiple births is increasing and twins are more likely to be born prematurely (Biancuzzo, 1994). As little research is available, a descriptive, exploratory study of the feeding patterns and feeding modes of twins at different gestational ages would be of value. A qualitative examination of the feeding goals, concerns, and problems of mothers breastfeeding twins would assist in determining areas where further research would be most valuable.

The role of maternal confidence and competence in the transition to exclusive breastfeeding in preterm infants needs further exploration. A qualitative investigation of how mothers make decisions about breastfeeding in the post-discharge period, similar to that done by Thoyre (2000) would be beneficial to the clinician who is advising these clients. The infant's role in feeding is very important and contributes to the success of feeding and to maternal confidence and competence. Tools like the one developed by Nyqvist, Rubertsson, Ewald, and Sjoden (1996) that describe the developmental stages in preterm breastfeeding behavior are valuable. Their instrument should be tested before it is used with mothers in the clinical setting. Research on the preterm infant's role in successful breastfeeding would help to identify those infants needing extra support.

Length of hospital stay is a controversial issue. More research is needed on the relationship between length of stay and breastfeeding. Meier et al. (1999) state that the length of stay in the United States is several weeks shorter than in Europe because the ability to gain weight when breastfeeding exclusively is not a criteria for discharge. In the hospitals from which the infants in this study were discharged, the criteria for discharge were related to the ability to gain weight on full oral feeds (R. Kavanaugh, personal communication, January 25, 2001; J. Sampson, personal communication, January 31, 2001). Full oral feeds in the hospital generally meant bottle-feeds, but included the breastfeeds that occurred when the mother was visiting. An early discharge program that provided expert support to families after discharge
may be a more acceptable option than longer hospital stays. A randomized, control trial could compare different lengths of hospital stay (with or without follow-up) on breastfeeding outcomes.

Meier et al. (1999) suggested that preterm infants are at risk for underconsumption of milk by exclusive breastfeeding until approximately full-term corrected age. The study by Ramesethu et al. (1993) demonstrated that preterm infants can be breastfed exclusively at home after a relatively brief hospitalization, without interventions such as pumping or supplementation with EMM or formula. These infants had a two to three week growth delay that was followed by a brisk catch up phase during which the infants surpassed the expected growth. The impact on long term breastfeeding and infant health of various discharge practices needs further study.

The feeding diaries provided a wealth of information on how preterm infants are fed in the post-discharge period. Diary-keeping required an ongoing commitment by the women in the study, and although it would be interesting to know how the feeding in the next four weeks occurred, it may be too much to ask of a new mother. Simplifying feeding diaries so they are easy to complete may facilitate their use in future research.

The examination of the feeding patterns and feeding mode of preterm infants in this study highlighted areas in which further research is required. How preterm infants make the transition to exclusive breastfeeding is an area where there is much speculation, and very little scientific inquiry. The literature on breastfeeding twins and multiples also lacks evidence-based information. The development of a standard classification for breastfeeding preterm infants that differentiates between breastmilk given and feeds directly at breast is essential to further research in this area.
Conclusions

This study examined the breastfeeding patterns of preterm infants born between 30 and 35 weeks gestation in the four week following hospital discharge. It illustrated the difficulty in making the transition from breast and bottle feeding to exclusive breastfeeding for these mothers and their infants. The transition to breastfeeding for preterm infants is a complex process that has not been well researched.

Breastmilk feeds received by infants changed very little during the four weeks after hospital discharge and 60% of the infants received greater than 87% breastmilk during that period. Initiation of an adequate milk supply in the first weeks after birth is a key factor in the eventual transition to feeding directly at breast. Women who have an adequate supply of milk in the first week after hospital discharge were more likely to exclusively breastfeed for the four-week period. Breastfeeding directly at the breast increased during the four-week period. The transition to feeding directly at breast is gradual, and may occur soon after discharge for some infants who are physiologically more competent, or may take more than four weeks for those who are more immature.

Many factors influence the ability to make the transition to exclusive breastfeeding, including length of hospital stay, maternal confidence and competence, and whether or not the infant was a twin. Length of hospital stay was related to increased percent of breastmilk feedings but not whether the infant was fed directly from the breast. Infants with the shortest length of stay had higher rates of breastmilk feeds and feeds directly at the breast and infants with the longest lengths of stay had higher rate of breastmilk feeds but not high rates of feeds directly at the breast. Breastfeeding patterns for singletons are different than for twin infants in that singletons received significantly more breastmilk feeds, and were fed directly at breast significantly more often.
Mothers who fed their infant exclusively breastmilk had higher levels of perceived competence than those feeding their infants breastmilk and artificial milk and mothers who fed directly at breast more than half the time significantly perceived themselves as more confident and competent in week one following hospital discharge. For all mothers their perceptions of confidence and competence increased significantly between weeks one and four.

The criteria by which to judge breastfeeding success are difficult to determine. A mother can say she has successfully breastfed if she meets her goals in regards to breastfeeding, and this varies from woman to woman. However, in the author's clinical experience many woman do not consider bottle feeding breastmilk to be breastfeeding success, rather it is a compromise solution when breastfeeding directly has not been achieved. When viewed this way, half of the sample had some measure of failure in breastfeeding, which leaves much room for improvement.
References


Appendix B

Post-Discharge Breastfeeding Pattern: Infant Data Worksheet

<table>
<thead>
<tr>
<th>ID#</th>
<th>Record #</th>
</tr>
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Gestational Age: ________ weeks  
Gender: F=1  M=2

Birth Weight: ________ grams  
Length of Stay: ________ days

Twin:  N=1  Y=2

Week One

Feeding Mode:  Breast only = 1  Breast & Bottle = 2  Bottle only = 3

% Breastmilk = # of Br feeds _____ + # of EBM supps._________

# of Br feeds + # of bottle feeds = %

1 = 100%  2 = > 80%  3 = 50-80%  4 = 20-49%  5 = <20%  6 = token

Criterion Group  1 = ≥ 50%  2 = < 50%

Week Two

Feeding Mode:  Breast only = 1  Breast & Bottle = 2  Bottle only = 3

% Breastmilk = # of Br feeds _____ + # of EBM supps._________

# of Br feeds + # of bottle feeds = %

1 = 100%  2 = > 80%  3 = 50-80%  4 = 20-49%  5 = <20%  6 = token

Criterion Group  1 = ≥ 50%  2 = < 50%
Page 2: Infant Data

ID#__________

Week Three

Feeding Mode:  Breast only = 1  Breast & Bottle = 2  Bottle only = 3

% Breastmilk = # of Br feeds _____ + # of EBM supps.__________

________________________________________________________ = %

# of Br feeds + # of bottle feeds

1= 100%  2= > 80%  3= 50-80%  4= 20-49%  5= <20%  6= token

Criterion Group  1= ≥ 50%  2= < 50%

Week Four

Feeding Mode:  Breast only = 1  Breast & Bottle = 2  Bottle only = 3

% Breastmilk = # of Br feeds _____ + # of EBM supps.__________

________________________________________________________ = %

# of Br feeds + # of bottle feeds

1= 100%  2= > 80%  3= 50-80%  4= 20-49%  5= <20%  6= token

Criterion Group  1= ≥ 50%  2= < 50%
Post-Discharge Breastfeeding Pattern: Maternal Data Worksheet

ID# _________  Record # _________

Age _______  Other Children  Yes = 1  No = 2

Level of Education (1-9) _______  Family Income (1-5) _______

Mother's Cultural Identity (1-12) _______

Previous Breastfeeding Experience:  Yes = 1  No = 2

Gestational Age: _______ weeks  Gender:  F=1  M=2

Birth Weight: _______ grams  Length of Stay: _______ days

Twin:  N=1  Y=2

Week One

Feeding Mode:  Breast only = 1  Breast & Bottle = 2  Bottle only = 3

Feeding Criterion Group  1= ≥ 50%  2= < 50%

Confidence: ______  Social Support: ISR _______

Competence: Skills/Knowledge ______  Valuing/Comfort_______

Total ______
Page 2: Maternal Data

Week Two

Feeding Mode:  Breast only = 1    Breast & Bottle = 2    Bottle only = 3

Feeding Criterion Group  1= ≥ 50%         2= < 50%

Confidence: _______                      Social Support: ISR _________

Competence: Skills/Knowledge _______     Valuing/Comfort _________

Total _______

Week Three

Feeding Mode:  Breast only = 1    Breast & Bottle = 2    Bottle only = 3

Feeding Criterion Group  1= ≥ 50%         2= < 50%

Confidence: _______                      Social Support: ISR _________

Competence: Skills/Knowledge _______     Valuing/Comfort _________

Total _______

Week Four

Feeding Mode:  Breast only = 1    Breast & Bottle = 2    Bottle only = 3

Feeding Criterion Group  1= ≥ 50%         2= < 50%

Confidence: _______                      Social Support: ISR _________

Competence: Skills/Knowledge _______     Valuing/Comfort _________

Total _______