Report of a Staff Program to Promote and Support Breastfeeding in the Care of Vulnerable Infants at a Children's Hospital

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ABSTRACT

Ill or premature infants do not have the opportunity to begin breastfeeding in an optimal manner; yet, these infants may benefit most from human milk. Health-care providers' knowledge of breastfeeding in both healthy and ill infants is frequently limited due to deficits in training. This article outlines a multifaceted approach to develop a comprehensive, hospital-wide system to support and promote breastfeeding for vulnerable infants. This approach was designed for the staff of the Children's Hospital of Philadelphia.

Journal of Perinatal Education, 14(1), 30–38, doi: 10.1624/105812405X23630

Keywords: breastfeeding, health-care provider knowledge, vulnerable infants

The American Academy of Pediatrics (AAP) recommends exclusive breastfeeding for the first 6 months of life, with continued breastfeeding for 1 year or more (AAP Work Group on Breastfeeding, 1997). The AAP, the World Health Organization (WHO, 2000), and many other professional groups have issued statements that promote breastfeeding and/or the use of human milk as the ideal form of infant nutrition for the first year of life or longer. In addition, the WHO and the United Nations Children's Fund (UNICEF) launched the Baby-Friendly Hospital Initiative to address the role of maternity services in protecting, promoting, and supporting breastfeeding (UNICEF, n.d.). The initiative consists of 10 recommendations (see Box 1).

UNICEF's recommendations are important steps for the successful initiation of breastfeeding in a birth hospital setting and are generally designed for healthy,

full-term infants. However, hospital practices and staff education also must be addressed for infants who are cared for in pediatric health-care institutions and for very vulnerable infants (preterm, low birth weight, congenital anomalies) who do not have the opportunity to begin breastfeeding in an ideal fashion. The focus of this article is to address the need for health-care professionals to possess knowledge and training about breastfeeding care and support for these vulnerable infants.

Breastfeeding initiation rates of mothers who deliver low-birth weight (LBW) or vulnerable infants are significantly lower than mothers who have healthy-term infants (Brown, Meier, Spatz, Zukowsky, & Spitzer, 1996). In addition, fewer than 50% of mothers of LBW or vulnerable infants who initiate breastfeeding are able to sustain breastfeeding until discharge (Brown et al., 1996). These are the infants who may benefit most from human milk. Some of the

BOX 1
UNICEF's Baby-Friendly Hospital Initiative

It is recommended that hospitals:

1. have a written policy regarding breastfeeding that is routinely communicated to all health-care staff;
2. train all health-care staff in skills necessary to implement this policy;
3. inform all pregnant women about the benefits and management of breastfeeding;
4. help mothers initiate breastfeeding within 30 minutes after birth;
5. show mothers how to breastfeed and how to maintain lactation even if they should be separated from their infants;
6. give newborn infants no food or drink other than breast milk, unless medically indicated;
7. practice rooming-in to allow mothers and infants to remain together 24 hours a day;
8. encourage breastfeeding on demand;
9. give no artificial teats or pacifiers to breastfeeding infants; and
10. foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

improved outcomes noted with breastfeeding and the use of human milk include, but are not limited to, the following: less physiological stress during breastfeeding as compared to bottle feeding (Meier, 1988; Meier & Anderson, 1987); reduction in the risk of necrotizing enterocolitis (Lucas & Cole, 1990; Neu, 1996); reduction in the risk of infection (el-Mohandes, Picard, Simmens, & Keiser, 1997; Narayanan, Prakash, & Gujral, 1981); greater enteral feed tolerance and more rapid weaning from intravenous nutrition (Armand et al., 1996; Simmer, Metcalf, & Daniels, 1997); improved retinal function (Faldella et al., 1996; Uauy, Birch, D. G., Birch, E. E., Tyson, & Hoffman, 1990); and improved neurocognitive development (de Andereca & Uauy, 1995; Morley, 1996). The second volume of *Pediatric Clinics of North America* (Schanler, 2001) contains clinical discussions of the evidence for and management of breastfeeding, including Meier's work with vulnerable infants. In spite of these clear indications that vulnerable infants benefit from breast milk, health-care providers have not yet successfully assisted mothers in providing breast milk and breastfeeding these infants.

HEALTH-CARE PROVIDERS' KNOWLEDGE OF BREASTFEEDING

Health-care providers' lack of knowledge, training, and education pertaining to breastfeeding has been

well documented in the literature. Eden, Mir, and Srinivasan (2000) surveyed program directors of every accredited pediatric residency program in the United States ($n = 209$) and found that 45% of the respondents rated the quality of their breastfeeding education as only mediocre or below and 43% of the respondents rated their program as inadequate or in need of improvement. In addition, Freed conducted multiple studies identifying a knowledge deficit among both physicians and nurses regarding basic breastfeeding information (Freed, 1993; Freed, Clark, Harris, & Lowdermilk, 1996; Freed, Clark, Lohr, & Sorenson, 1995; Freed, Clark, Sorenson, et al., 1995). In a study of pediatric, obstetric, and family physicians and residents ($n = 3,115$ residents and $n = 1,920$ physicians), Freed, Clark, Lohr and colleagues' (1995) key findings highlighted the inadequacy of breastfeeding education and training.

Specifically related to pediatric settings, Freed noted in his survey of a national random sample of 736 pediatric residents (response rate = 74%) that 73% rated their residency training as inadequate preparation to promote breastfeeding (Freed, Clark, Lohr, et al., 1995). However, 49% of the sample found themselves in the position of having to provide breastfeeding support more often than expected. Schanler, O'Connor, and Lawrence (1999) also conducted a survey of active fellows in the AAP with a 70% response rate ($n = 1,602$) and found that 86% of respondents would like to receive additional education on breastfeeding management. In addition, only 58% of the responders reported having received any education on breastfeeding management while in medical school or during their residency.

Freed and colleagues (1996) also conducted a survey to assess the knowledge of nursing students ($n = 272$) in the final year of their programs (both Bachelor of Science Degree in Nursing and Associate Degree programs). Although 93% reported having received a lecture on breastfeeding, only 25% received any experience related to breastfeeding during clinical activities. Anderson and Geden (1991) also noted that nurses received insufficient education and training to effectively support breastfeeding mothers.

This lack of sufficient training creates a risk that many health-care providers will give inadequate, inappropriate, or no breastfeeding assistance and advice, which in turn often results in breastfeeding failure. When inadequate training is coupled with

caring for vulnerable infants with multiple medical diagnoses, the combination creates significant challenges in promoting and maintaining breastfeeding for infants who could benefit the most from receiving human milk. Clearly, a need exists to develop models of breastfeeding education and support for health-care providers who work with vulnerable infants. However, little has been written on the specific systems needed to supplement hospital-staff education as a means to improve breastfeeding outcomes for vulnerable populations. Details of the entire education needed by staff are beyond the scope of this paper. Rather, this article focuses on the components of a hospital-wide system.

FACILITATING BREASTFEEDING IN VULNERABLE INFANTS

When confronted with mother-infant separation, the first and most crucial step in developing and protecting a milk supply is the establishment of a pumping schedule with the mother. With a healthy, full-term infant, the WHO Baby-Friendly Hospital Initiative recommends the infant go to breast within the first 30 minutes after birth. Yet, when a mother gives birth to a preterm or sick infant, pumping is not usually initiated in the birthing room. In fact, a study conducted in 1999 found that only 37% of birth hospitals in Philadelphia had breast pumps available at all times (Kovach, 2002). In our clinical practice at Children's Hospital of Philadelphia (not a birth hospital), few of the mothers whose vulnerable infants were transferred to our facility had been instructed to initiate pumping within 6 hours after birth and many reported their birth hospital had not offered adequate instructions related to pumping.

In order to mimic the feeding pattern of a healthy, full-term infant, a mother must have access to a hospital-grade electric pump both at home and while visiting her infant in the hospital. A hospital-grade pump is built for sustained use and automatically cycles the suction-and-release motions similar to a baby. It does not include minielectric, battery-operated, or hand pumps, which are useful for occasional feeding relief. Mimicking the feeding pattern of a healthy, full-term infant includes maintaining a pumping schedule of approximately 8 times in a 24-hour period to stimulate the mother's prolactin levels and ensure a copious milk supply. Mothers of both term and preterm infants produce primarily small quantities of colostrum in the first 48 hours following birth; however, stimulation of

the breast is important for the initiation of Stage 2 lactogenesis and more copious milk secretion. (Riordan, 2004). Initially, vulnerable infants do not require large volumes of breast milk, but the establishment of the supply is crucial during the first 1 to 2 weeks following birth. Our institutional policy recommends mothers work to establish and maintain a 24-hour milk production between 500 and 1,000 cc's, which is consistent with the normal range of milk production at Stage 2 lactogenesis, as reported in the literature (440 to 1,220 cc's per 24 hours) (Kent, Mitoulas, Cox, Owens, & Hartmann, 1999).

Once a milk supply is established, the next step in the process is feeding the infant its mother's milk once the infant is deemed stable and ready for enteral feeds. At this point, strategies such as the use of the creatocrit technique for determining caloric adequacy can be implemented (Lucas, Gibbs, Lyster, & Baum, 1978). This is a simple process of using a centrileve with capillary tubes filled with breast milk to separate the percentage that is fat. It is the same equipment used to do hematocrits. Also useful are lacto-engineering and hind milk to promote growth (Meier, 1998; Valentine, Hurst, & Schanler, 1994). Lacto-engineering is the process of fractionating human milk in order to enhance caloric density. The mother simply separates her milk. The first milk a mother expresses is fore milk, which is low in calories. As the milk expression session continues, the amount of fat and calories in the milk increases (Riordan, 2004). Mothers can be taught to fractionate their breast milk and even to do the creatocrit procedure (Griffin, Meier, Bradford, Bigger, & Engstrom, 2000). To facilitate the eventual transition of the infant to breastfeeding, skin-to-skin care (Ludington-Hoe, Thompson, Swinth, Hadeed, & Anderson, 1994) and non-nutritive sucking at the breast (Narayanan, Mehta, Choudhury, & Jain, 1991) are integral to care. Once care providers determine that the infant is ready for oral feeds, it is important to make the transition to oral feeds at the breast, rather than the bottle, in order to facilitate learning to suckle (Meier, 1988; Meier et al., 2000). In addition, the use of a nipple shield to facilitate milk transfer (Meier et al., 2000) and the use of the Baby Weigh Scale to determine milk transfer (Meier et al., 1994) are key components of care. Despite significant research on these effective methods of providing breast milk to sick and preterm infants, a gap has existed in translating this research into clinical practice.

CHILDREN'S HOSPITAL OF PHILADELPHIA'S EXPERIENCE IN DEVELOPING A BREASTFEEDING EDUCATION AND TRAINING PROGRAM

Because the process is complex, putting research into practice requires institutional commitment and a well-trained, knowledgeable medical and nursing staff. At Children's Hospital of Philadelphia, we have addressed the need for breastfeeding education and training of professionals who care for the most vulnerable infants. This author developed a multifaceted approach for education, training, and knowledge dissemination. A variety of strategies was utilized and will be discussed below, including the following components:

1. the development of a continuous quality-improvement team to address problems with breast-milk handling and storage;
2. a hospital-wide survey of nurses' knowledge regarding the breast-milk management and a resultant Web-based nursing competency;
3. the establishment of a hospital-wide breastfeeding committee;
4. the development of breastfeeding resource binders for each unit;
5. educational programs for staff nurses and residents; and
6. a clinical consensus program on the use of human milk and breastfeeding for the high-risk infant.

Breast-Milk Handling and Storing

The continuous quality-improvement (CQI) team assessed the issues surrounding the labeling, storage, and handling of breast-milk management. This team clearly identified the lack of basic knowledge among nursing staff regarding breast pumping and storage of breast milk. From this, a hospital-wide breast-milk management system was developed, as well as nursing standards and policies and procedures. In total, two evidence-based nursing standards and seven evidence-based policies and procedures were developed and placed on the hospital's Web site, which is part of the hospital's intranet and therefore not accessible to the general public. These two nursing standards are 1) "Establishing Breastfeeding" and 2) "Breastfeeding Assistance for the New and High-Risk Infant." The seven policies and procedures were:

1. "Pumping and Storage of Breast Milk";
2. "Administration and Fortification of Breast Milk";

All breastfeeding standards and policies were developed using the most current research and, to maintain evidence-based currency, are annually reviewed by the hospital-wide committee.

3. "Transport or Disposal of Breast Milk";
4. "Skin-to-Skin Contact/Kangaroo Care";
5. "Test Weights for Breastfeeding";
6. "Use of the Nipple Shield"; and
7. "Use of the Supplemental Nurser System."

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Another accomplishment of the CQI team was the establishment of a standardized bin and label system for the storage of breast milk (see Figures 1, 2, and 3). Hospital-wide tracking is carried out by trained research assistants (nursing students) who visit each unit daily to assess compliance. Unit-based tracking is the responsibility of the breast-milk management team leaders on each unit. One or more nurses from each unit volunteer to serve as breast-milk team leaders in addition to completing duties on their regularly assigned shift. These leaders vary from unit to unit: On some units, the charge nurse assumes the responsibility daily; on other units, bedside nurses complete the checks. These leaders carry out the following tasks:

1. Check the refrigerator to ensure that all breast milk is in a labeled bin with a lid and that the bottle is labeled with the infant's name and medical record number.
2. Check the refrigerator for expired or mislabeled milk.
3. Ensure that all breast milk is stored with a tight-fitting lid (bottle nipples are not permitted).
4. Clean up any spills or contact housekeeping staff to do so.
5. Ensure that all breast milk stored in the refrigerator is sent home with a discharged infant; if not sent home, contact the mother. If the mother does not want to come and pick it up, dispose of the milk in a red, biohazard trash can.
6. Remove empty bins from the refrigerator and freezer and place in dirty utility room for cleaning.

Figure 1 Bin System for Storage of Breast Milk

7. Record findings on a tracking sheet. Tracking sheets are submitted monthly to the CQI team.

This standardized storage system and unit-based breast-milk management has resulted in steadily increasing compliance with breast-milk management policies and procedures.

Improving Nurses' Knowledge of Breast-Milk Management

Another component of improving nurses' knowledge was the completion of a hospital-wide nurse survey on breast-milk management, which resulted in the development of a Web-based nursing competency presentation on the subject. During 2003, all 14 inpatient units were required to participate in the survey. In total, 407 surveys out of 886 distributed were completed for a 46% response rate. Data from the survey demonstrated that gaps existed in

BREAST MILK		FORM #NUR-1390 (Rev. 12/00)
Infant's Full Name: _____		
Infant's MR#: _____		
Date Pumped: _____	Time Pumped: _____	
Date Frozen: _____	Time Frozen: _____	
Date Thawed: _____	Time Thawed: _____	
MATERNAL MEDICATIONS ☐ YES ☐ NO		

Figure 2 Storage Label for Breast Milk

nurses' knowledge regarding breast-milk management despite the fact that standards and policies had been implemented for approximately 2 years. The survey results were shared with the hospital's nurse educators, who were supportive of the development of hospital-wide nurse competency measures. A Web-based PowerPoint competency presentation was developed and completed by nurses throughout the hospital during the 2004 fiscal year. The objectives of the competency project are for the nurse to be able to:

1. assess for any mother who is planning to breastfeed or currently breastfeeding and assess the mother's immediate needs (e.g., need to express milk via pumping);
2. identify hospital-wide resources;
3. describe the physiology of milk production and appropriate pumping protocols; and
4. identify the principles of breast-milk management.

Nurses complete this competency as part of their annual review requirements, which include knowledge in other topics such as patient safety and child

PREPARED BREAST MILK		Form #NUR-1391 (Rev. 12/00)
Infant's Full Name: _____		
Infant's MR#: _____		
Date Prepared: _____	Time Prepared: _____	
Amount Prepared: _____		
Additives: _____		
Calories: _____	Use By: _____	

Figure 3 Storage Label for Fortified Breast Milk

abuse. This review process is monitored at the nurse-manager level.

Breastfeeding Committee

Because breastfeeding infants can be found throughout our hospital, a hospital-wide breastfeeding committee was established to bring together lactation specialists, nursing staff, dietitians, and physicians. This committee is integral to disseminating new information, evaluating progress, and planning for future projects. A staff nurse from every inpatient nursing unit in the institution serves on the committee, allowing information to be tailored to unit-based needs. However, the hospital-wide participation has led to joint projects. For example, the hospital's newborn infant center is currently conducting a CQI project to increase the number of infants who participate in skin-to-skin care, daily. This project has prompted the nursing staff in the pediatric intensive care unit to examine the role of holding and touching infants in their unit and, thus, they have instituted a similar CQI project.

Unit-Specific Resource Binders

Binders containing breastfeeding resources were developed and distributed to each inpatient and outpatient nursing area. These binders include one copy of all the patient-family education materials about breastfeeding that are available for families. In addition, the binders include a listing of all the breastfeeding resource nurses (described below) throughout the hospital. The binders also include sample letters for a physician to sign for parents who seek reimbursement for the cost of a hospital-grade electric breast pump from their insurance company. Instructions for ordering patient-family education materials are included, and some of the materials may be downloaded from the hospital's intranet. A four-page teaching plan is also available on the hospital's intranet for nurses to download and follow when working with breastfeeding families.

Resources for Nursing Staff

When lactation specialists see a family, they spend only one or two hours with the family. However, carrying out the breastfeeding plan during the remainder of the day is left in the hands of the bedside nurse. Thus, staff-nurse education was deemed integral in developing resources and promoting significant changes in hospital practices. Although our goal as an institution is to have a lactation spe-

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cialist tend to every infant, the practice may not always be possible due to timing, census, or a variety of other issues.

Due to the critical role the bedside nurse plays in breastfeeding support and education and because of the identified lack of training and education cited by nurses, a breastfeeding resource course was established for nurses. This 2-day, 16-hour course is open to all nurses at the Children's Hospital of Philadelphia. The course was designed to focus specifically on the needs of vulnerable infants; however, it also provides the participants an overview of breastfeeding in all populations. The goal of the course is to increase nurses' knowledge regarding breastfeeding and, equally important, to assist the nurse in becoming an advocate and resource for breastfeeding families on individual units. (See Box 2 for an outline of the course's content.) Each attendee receives a 1-inch binder that contains handouts on all the topics listed, as well as some key research articles.

This course is now entering its third year and has been extended to include nurses in the outpatient settings. The course is listed in the hospital's continuing career development catalogue and is advertised through the breastfeeding committee, fliers, and direct outreach to nurse managers. The course is offered four times annually, during both the day shift and evening hours, to allow for maximal staff participation. To date, 215 nurses have taken the course. Participants' course evaluations have been extremely positive, and 100% of staff report they would recommend the session to a colleague.

Following completion of the course, the nurse is expected to serve as a resource on her unit. Each nurse receives a bright yellow pin that states "Ask Me—Breastfeeding Resource Nurse." The pins have been useful in promoting visibility. In addition, each unit posts breastfeeding resource nurses for both their individual unit and the entire hospital. Because the Newborn Infant Center has the largest proportion of nurses trained, it is also described as the unit to contact for questions about the nursing standards, policies, and procedures.

BOX 2

Specific Content Objectives for Breastfeeding Resource Nurse Course

Day 1 – Participants will be able to accomplish the following:

1. articulate the benefits of breastfeeding for mother, infant, family, and society;
2. identify the role of culture and support in breastfeeding outcomes;
3. identify both Children's Hospital of Philadelphia and community resources for breastfeeding;
4. share knowledge about the anatomy and physiology of breastfeeding in both the mother and infant;
5. effectively evaluate a breastfeeding session;
6. evaluate breastfeeding positioning and latch-on techniques and help a mother with both approaches; and
7. evaluate normal intake and output of breastfeeding infants.

Day 2 – Participants will gain the following:

1. knowledge regarding maternal-infant separation issues surrounding breastfeeding:
 - pumping
 - initiation of feeds
 - lacto-engineering
 - skin-to-skin care
 - non-nutritive sucking
 - transition to breast
 - use of test weights
 - definition of complement and supplement;
2. awareness of alternative feeding methods, including the supplemental nursing system and nipple shield;
3. awareness of the biological specificity and composition of breast milk;
4. knowledge about the transfer of drugs in breast milk;
5. knowledge about the transfer of viruses in breast milk;
6. the ability to review maternal nutritional requirements during lactation;
7. the ability to review other maternal and infant issues that may complicate breastfeeding;
8. the ability to understand thrush and the treatment of mother and infant;
9. awareness of sexuality issues related to breastfeeding;
10. the ability to discuss combining work and breastfeeding;
11. awareness of human-milk banking and how to refer this service to mothers.

Resources for Hospital Residents

The author works with her physician colleagues in the delivery of a multitiered, educational approach for the residents, fellows, and attending staff. She presents the first-year pediatric residents with

1 hour of didactic content regarding breastfeeding in the healthy-term population. This lecture includes anatomy and physiology, the expected breastfeeding process for the healthy newborn, avenues for providing appropriate support and follow-up services for breastfeeding, and ways to help a breastfeeding mother for her return to work. During this rotation, the residents are also encouraged to work with and observe healthy, new breastfeeding mothers and their infants. In addition, one of the lactation specialists is available by phone or email to answer questions that may arise during the resident's rotation.

During the second year of residency, each resident completes a rotation in the newborn infant center, working with vulnerable infants. The second-year residents receive 1 hour of didactic content specifically focused on breastfeeding the preterm or ill infant. These residents are provided with a brief fact sheet and eight research-based articles that complement the lecture. The focus of the training in this year includes the following topics:

1. Initiation of pumping, pumping schedule, normal milk volumes, and maintenance of milk supply for mothers who are pumping for extended periods of time;
2. Feeding of human milk, creatocrit, and lacto-engineering;
3. Skin-to-skin care and non-nutritive sucking;
4. The transition to breastfeeding, including the potential use of a nipple shield to enhance milk transfer;
5. The use of test weights for measuring milk transfer;
6. Resources available in the institution.

In addition, the lactation specialists conduct periodic rounds with the medical team in the intensive care nursery to discuss the breast-milk and breastfeeding plan for all infants receiving human milk. These rounds serve as an opportunity for further education and discussion of the most current research-based interventions that support breastfeeding in this vulnerable population.

During their third year, residents work at hospital-affiliated primary care centers. Unfortunately, due to low breastfeeding duration rates in the neighborhoods that surround our clinics, the residents often do not have the opportunity to work with breastfeeding mothers. Because of this limitation, the residents are given an opportunity to complete a self-learning module on breastfeeding with

a primary care focus. Currently, this part of the training is not mandatory. Due to the voluntary nature of participation, the program has not yet been successful in tracking participation.

Clinical Consensus Efforts

Another accomplishment is the establishment of a clinical consensus. The clinical consensus is a venue for bringing together a multidisciplinary group to examine the current research on a topic. Nurses, physicians, dietitians, and lactation specialists formed a working group that met for 5 months to examine and review all current literature related to the use of human milk and breastfeeding for high-risk infants. This work group shared the evidence-based data through two 2-hour presentations, to which all attending physicians, neonatal fellows, residents, nurses, and nursery staff were invited. This process allowed us to collectively assess where we were and where we needed to go with providing evidence-based breastfeeding care in the hospital's newborn infant center. The process is similar to a CQI process, yet its focus is different. The CQI team was comprised mainly of nurses seeking to improve current practice parameters. The clinical consensus method is how agreement is reached among our physicians to determine a standard of care in our unit.

CONCLUSION

Our education and training programs for both nurses and physicians have established a comprehensive, institution-wide process to advance improvement in breastfeeding knowledge, care, support, and management. Thus, nurses and physicians ultimately work toward providing a positive impact on the lives of vulnerable infants. Through a comprehensive approach to breast-milk management, the hospital-wide breastfeeding committee, the development of breastfeeding resource binders, a Web-based nursing competency program, and an interdisciplinary clinical consensus, the promotion of a hospital culture surrounding human milk and breastfeeding has become systematic and highly visible. As one nurse stated, "It used to be that breastfeeding was invisible in our hospital—you knew it occurred, but everyone ignored it." Now, in our hospital, breastfeeding and/or the provision of human milk are viewed as integral to an infant's care and, by improving our staff education and training, the patient-family experience has been addressed.

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ACKNOWLEDGMENT

The author acknowledges the Foerderer Foundation at the Children's Hospital of Philadelphia for providing funding for this program.

REFERENCES

- American Academy of Pediatrics Work Group on Breastfeeding. (1997). Breastfeeding and the use of human milk. *Pediatrics*, 100, 1035–1039.
- Anderson, E., & Geden, E. (1991). Nurses' knowledge of breastfeeding. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 20, 58–64.
- Armand, M., Hamosh, M., Mehta, N. R., Angelus, P. A., Philpott, J. R., Henderson, T. R., et al. (1996). Effect of human milk or formula on gastric function and fat digestion in the premature infant. *Pediatric Research*, 4, 429–437.
- Brown, L. P., Meier, P., Spatz, D. L., Zukowsky, K., & Spitzer, A. (1996). Use of human milk for low-birth-weight infants. *Online Journal of Knowledge Synthesis for Nursing*, 3(doc 3, Online #27), 1–9.
- de Andraca, I., & Uauy, R. (1995). Breastfeeding for optimal mental development: The alpha and omega in human milk. *World Review of Nutrition and Dietetics*, 78, 1–27.
- Eden, A. N., Mir, M. A., & Srinivasan, P. (2000). The pediatric forum—Breastfeeding education of pediatric residents: A national survey. *Archives of Pediatric and Adolescent Medicine*, 154, 1271–1272.
- el-Mohandes, A. E., Picard, M. B., Simmens, S. J., & Keiser, J. F. (1997). Use of human milk in the intensive care nursery decreases the incidence of nosocomial sepsis. *Journal of Perinatology*, 17, 130–134.
- Faldella, G., Govoni, M., Alessandroni, R., Marchiani, E., Salvioli, G. P., Biagi, P. L., et al. (1996). Visual evoked potentials and dietary long chain polyunsaturated fatty acids in preterm infants. *Archives of Disease in Childhood Fetal & Neonatal Edition*, 75, F108–F112.
- Freed, G. L. (1993). Breastfeeding: Time to teach what we preach. *Journal of the American Medical Association*, 269, 243–245.
- Freed, G. L., Clark, S. J., Harris, B. G., & Lowdermilk, D. L. (1996). Methods and outcomes of breastfeeding instruction for nursing students. *Journal of Human Lactation*, 12, 105–110.
- Freed, G. L., Clark, S. J., Lohr, J. A., & Sorenson, J. R. (1995). Pediatrician involvement in breastfeeding promotion: A national study of residents and practitioners. *Pediatrics*, 96, 490–494.

- Freed, G. L., Clark, S. J., Sorenson, J., Lohr, J. A., Cefalo, R., & Curtis, P. (1995). National assessment of physicians' breastfeeding knowledge, attitudes, training, and experience. *Journal of the American Medical Association*, 273, 472–476.
- Griffin, T. L., Meier, P. P., Bradford, L. P., Bigger, H. R., & Engstrom, J. L. (2000). Mothers' performing creatinuria measures in the NICU: Accuracy, reactions, and cost. *Journal of Obstetric, Gynecologic and Neonatal Nursing*, 29(3), 249–257.
- Kent, J. C., Mitoulas, L. R., Cox, D. B., Owens, R. A., & Hartmann, P. E. (1999). Breast volume and milk production during extended lactation in women. *Experimental Physiology*, 84, 435–447.
- Kovach, A. C. (2002). A 5-year follow-up study of hospital breastfeeding policies in the Philadelphia area: A comparison with the ten steps. *Journal of Human Lactation*, 18, 144–153.
- Lucas, A., & Cole, T. J. (1990). Breast milk and neonatal necrotizing enterocolitis. *Lancet*, 336, 1519–1523.
- Lucas, A., Gibbs, J. A., Lyster, R. L., & Baum, J. D. (1978). Creatinuria: Simple clinical technique for estimating fat concentration and energy value of human milk. *British Medical Journal*, 1, 1018–1020.
- Ludington-Hoe, S. M., Thompson, C., Swinth, J., Hadeed, A. J., & Anderson, G. C. (1994). Kangaroo care: Research results and practice implications and guidelines. *Neonatal Network*, 13, 19–27.
- Meier, P. (1988). Bottle- and breastfeeding: Effects on transcutaneous oxygen pressure and temperature in preterm infants. *Nursing Research*, 37, 36–41.
- Meier, P. (1998). Extremely low birth weight infants: Individualizing lipid content in own mother's milk. *ABM News and Views: The Newsletter of the Academy of Breastfeeding Medicine*, 4, 1–6.
- Meier, P., & Anderson, G. C. (1987). Responses of small preterm infants to bottle- and breastfeeding. *Maternal Child Nursing*, 12, 97–105.
- Meier, P. P., Brown, L. P., Hurst, N. M., Spatz, D. L., Engstrom, J. L., Borucki, L. C., et al. (2000). Nipple shields for preterm infants: Effect on milk transfer and duration of breastfeeding. *Journal of Human Lactation*, 16, 106–114.
- Meier, P. P., Engstrom, J. L., Crichton, C. L., Clark, D. R., Williams, M. M., & Mangurten, H. H. (1994). A new scale for in-home test-weighing for mothers of preterm and high-risk infants. *Journal of Human Lactation*, 10, 163–168.
- Morley, R. (1996). The influence of early diet on later development. *Journal of Biosocial Science*, 28, 481–487.
- Narayanan, I., Mehta, R., Choudhury, D., & Jain, B. K. (1991). Sucking on the "emptied" breast: Non-nutritive sucking with a difference. *Archives of Diseases in Childhood*, 66, 241–244.
- Narayanan, I., Prakash, K., & Gujral, V. V. (1981). The value of human milk in the prevention of infection in the high-risk low-birth-weight infant. *Journal of Pediatrics*, 99, 496–498.
- Neu, J. (1996). Necrotizing enterocolitis: The search for a unifying pathogenic theory leading to prevention. *Pediatric Clinics of North America*, 43, 409–432.
- Riordan, J. (2004). *Breastfeeding and human lactation* (3rd ed.). Sudbury, MA: Jones and Bartlett.
- Schanler, R. J. (2001). The use of human milk for premature infants. *Pediatric Clinics of North America*, 48(1), 207–219.
- Schanler, R. J., O'Connor, K. G., & Lawrence, R. A. (1999). Pediatricians' practices and attitudes regarding breastfeeding promotion. *Pediatrics*, 103, 659–660.
- Simmer, K., Metcalf, R., & Daniels, L. (1997). The use of breast milk in a neonatal unit and its relationship to protein and energy intake and growth. *Journal of Paediatrics and Child Health*, 33, 55–60.
- Uauy, R., Birch, D. G., Birch, E. E., Tyson, J. E., & Hoffman, D. R. (1990). Effect of dietary omega-3 fatty acids on retinal function of very-low-birth-weight neonates. *Pediatric Research*, 28, 485–492.
- United Nations Children's Fund. (n.d.). *The baby-friendly hospital initiative*. Retrieved December 18, 2003, from <http://www.unicef.org/programme/breastfeeding/baby.htm#10>
- Valentine, C. J., Hurst, N. M., & Schanler, R. J. (1994). Hind milk improves weight gain in low-birth-weight infants fed human milk. *Journal of Pediatric Gastroenterology and Nutrition*, 18, 474–477.
- World Health Organization. (2000). *Nutrition: Infant and young child*. Retrieved December 18, 2003, from http://www.who.int/child-adolescent-health/NUTRITION/infant_exclusive.htm

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