

STATE-OF-THE-ART

The risks and benefits of infant feeding practices for women and their children

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Infant feeding decisions affect maternal and child health outcomes, worldwide. Even in settings with clean water and good sanitation, infants who are not breast-fed face an increased risk of infectious, as well as non-infectious morbidity and mortality. The decision not to breast-feed can also adversely affect mothers' health by increasing the risk of pre-menopausal breast cancer, ovarian cancer, type II diabetes, hypertension, hyperlipidemia and cardiovascular disease. Clinicians who counsel mothers about the health impact of infant feeding and provide evidence-based care to maximize successful breast-feeding, can improve the short and long-term health of both mothers and infants.

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Introduction

Health outcomes differ substantially for mothers and infants who formula-feed, compared with those who breast-feed, even in wealthy countries such as the United States. Unfortunately, rates of breast-feeding in the United States continue to fall short of the World Health Organization's recommendations that children are breast-fed for their first 2 years of life.¹ The American Academy of Pediatrics² and the American Academy of Family Physicians³ recommend exclusive breast-feeding for the first 6 months of life, continuing at least through the infant's first birthday, and as long thereafter as is mutually desired. In the United States, in 2005, only 74% of the United States infants were breast-fed at least once after delivery, only 32% were exclusively breast-fed at 3 months of age, and just 12% were exclusively breast-fed at 6 months of age.⁴ These rates vary considerably by region, with the highest rates in the

Pacific Northwest and the lowest rates in the Southeast. Although some of this variation reflects cultural differences, recent data suggest that variations in hospital practices account for a considerable proportion of disparities in breast-feeding.⁵ This suggests that improvements in the quality of antenatal and perinatal support for breast-feeding could have a substantial impact on public health. For this reason, it is important for clinicians to have a clear understanding of the risks and benefits of infant feeding practices for women's and children's health.

The risks of formula-feeding

For many years, public health campaigns and the medical literature have described the 'benefits of breastfeeding,' comparing health outcomes among breast-fed infants against a reference group of formula-fed infants. Although statistically synonymous with reporting the 'risk of not breastfeeding,' this approach implicitly defines infant formula as the normal way to feed an infant. This subtle distinction substantially affects perceptions of infant feeding.^{6–8} If 'breast is best,' then formula is implicitly 'good' or 'normal.' This distinction was underscored by a national survey showing that, in 2003, while 74% of the United States residents disagreed with the statement, 'Infant formula is as good as breast milk,' just 24% agreed with the statement, 'Feeding a baby formula instead of breast milk increases the chance the baby will get sick.'⁹

These distinctions appear to influence feeding decisions. In 2002, the Ad Council conducted focus groups to develop the National Breastfeeding Awareness Campaign, targeted at reproductive-aged women who would not normally breastfeed. They found that women who were advised about the 'benefits of breastfeeding' viewed lactation as optional, like a multivitamin, that was helpful but not essential for infant health. In contrast, when the same data were presented as the 'risk of not breastfeeding,' women were far more likely to say that they would breastfeed their infants. Given these findings, this review will describe the risks of formula-feeding when presenting differences in maternal and child health outcomes.

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In addition, this article reviews the clinician's role in counseling women regarding infant feeding and ensuring chances of breast-feeding success are maximized at birth.

Impact of infant feeding on maternal health

Premature weaning, or not breast-feeding, is associated with health risks for mothers as well as for infants. Epidemiological data suggest that women who do not breast-feed face higher risks of cancer and cardiovascular diseases. It should be noted that in many studies of maternal health outcomes, associations have been reported according to lifetime duration across all pregnancies, rather than the duration of feeding for each pregnancy. In addition, most evidence arises from observational studies, which may be subject to confounding by other health behaviors.

Lactation and maternal malignancy

Lactation suppresses ovulation, leading to lactational amenorrhea. In addition, lactogenesis leads to terminal differentiation of the breast tissue, which may reduce malignant transformation. These effects may mediate associations between breast-feeding and breast and ovarian cancer.

Breast cancer

Multiple studies have now examined the relationship between breast-feeding and breast cancer risk. A recent meta-analysis of 47 studies found that each year of breast-feeding was associated with a 4.3% reduction in risk of invasive breast cancer.¹⁰ Women who had never breast-fed had a 1.4-fold increased risk of breast cancer, compared with women who had breast-fed for a lifetime total of ≥ 55 months. This meta-analysis was important because longitudinal studies have produced conflicting results^{11–15} and observational studies relating lactation and breast cancer among post-menopausal women have largely failed to identify an association.^{13,16} Although reports from case-control studies have suggested a modest protective effect of breast-feeding on pre-menopausal breast cancer risk, these studies may be limited by the potential for recall bias.^{17,18}

Ovarian cancer

Multiple case-control studies have found a higher risk of ovarian cancer among parous women who have never breast-fed. In a meta-analysis, women who had never breast-fed had a 1.3-fold higher risk of ovarian cancer than parous women who had never breast-fed.¹⁹ Danforth *et al.*²⁰ prospectively examined the risk of ovarian cancer in the Nurses' Health Studies, and found that parous women who had never breast-fed faced a 1.5-fold risk of ovarian cancer, compared with women who breast-fed for ≥ 18 months.

It is interesting to note that women who developed mastitis while breast-feeding had the lowest risk of ovarian cancer, those

who breast-fed and did not develop mastitis had an intermediate risk of ovarian cancer, whereas those who never breast-fed had the highest rates of ovarian cancer.²¹ Researchers hypothesize that antibodies to MUC1, which develop during mastitis, may have a role in reducing the risk of ovarian cancer. In a case-control study, Cramer *et al.*²¹ found higher levels of MUC1 antibodies among women who had breast-fed and developed mastitis.

Lactation and the risk of maternal cardiovascular disease

Breast-feeding requires a substantial metabolic expenditure; an exclusively breast-fed infant requires that mothers should use 500 kcal d^{-1} to produce milk. This metabolic load may help mobilize the weight gained during pregnancy. In addition, breast-feeding is associated with more favorable glucose levels, lipid metabolism and blood pressure. Epidemiological studies suggest that these differences may persist after weaning, with long-term benefits for mothers.²²

Dewey *et al.*²³ compared weight loss during the first year postpartum between two groups of women: those breast-feeding < 3 months, and those continuing for ≥ 1 year. Women who were intentionally dieting to lose weight were excluded from the study. Women in the prolonged breast-feeding group lost 4.4 lbs more than women who weaned at 3 months. This difference in weight persisted for 2 years postpartum. Other studies have found mixed results,¹⁹ suggesting that differences in caloric intake and physical activity have a role in postpartum weight change. Results from a randomized, controlled trial in Honduras provide evidence that breast-feeding can mobilize calories for weight loss.²⁴ Exclusively breast-feeding women were randomized at 4 months postpartum to introduce complementary foods for their infants or continue to breast-feed exclusively. At 6 months, exclusively breast-feeding mothers had lost 600 g more than those in the complementary feeding group. Based on measurements of milk volume, the exclusively breast-feeding mothers expended 5520 additional kcal over the 2-month period. The authors noted that 600 g of mobilized fat would provide 5400 kcal. These results provide causal evidence that more intense lactation mobilizes additional adipose stores.

Lactation and maternal diabetes. Differences in metabolism between breast-feeding and formula-feeding women appear to persist into later life. Several authors have found a higher risk of diabetes and the metabolic syndrome among women who have never breast-fed, compared with those who breast-fed for a prolonged period. In the Nurses' Health Studies, the risk of type II diabetes in the 15 years since their last birth was 1.7-fold higher among parous women who never breast-fed, compared with those who breast-fed for a lifetime total of ≥ 2 years. Villegas *et al.*,²⁵ examined data from the Shanghai Women's Health Study and found that women who had breast-fed their children tended to have a 12% lower risk of diabetes mellitus than those who had never breast-fed. Using data from the Women's Health Initiative,

Schwarz *et al.*²⁶ found a significant dose-response effect when examining the duration of lactation and risk of Type 2 diabetes. After adjusting for socio-demographic, family history, lifestyle variables and body mass index they found that the odds ratio of developing diabetes for women who had breast-fed for 1–6 months was 0.91(0.84–0.99); for women who had a lifetime history of breast-feeding for 13–23 months, they found an odds ratio for developing diabetes of 0.75(0.66–0.85).

Lactation and maternal hypertension. A Korean study found that lactation decreased mothers' risk of developing hypertension by 8%.²⁷ Similarly, in the United States, using data from the Women's Health Initiative, authors estimated that for every 29 women who breast-fed for more than 1 year, 1 case of post-menopausal hypertension would be prevented.²⁶

Lactation and maternal hyperlipidemia. Data from the Women's Health Initiative also indicates that for every 40 women who breast-fed more than 1 year, one case of post-menopausal hyperlipidemia would be prevented.²⁶ Ram *et al.*²⁸ assessed the prevalence of metabolic syndrome in a cohort of middle-aged women and found that each year of lactation decreased risk of developing the metabolic syndrome by 12%. In the CARDIA cohort, women who breast-fed less than three months had less favorable lipid profiles than women who breast-fed for three months or more.²⁹

Lactation and maternal cardiovascular disease. In the Nurses' Health Study, never having breast-fed was linked with a 1.3-fold risk of myocardial infarction, compared with lifetime breast-feeding for 2 years or more.³⁰ Over an average of 7.9 years of post-menopausal participation in the Women's Health Initiative, women with a single live birth who never breast-fed were 28% more likely to develop CVD than women who breast-fed for 7–12 months.²⁶

Infant feeding and child health outcomes

Infectious morbidity

Compared with breast-fed infants, formula-fed infants are more likely to develop an infection in the first year of life. This increased risk of infectious morbidity and mortality is explained, in part, by specific and innate immune factors present in human milk.³¹ Plasma cells in the bronchial tree and intestine migrate to the mammary epithelium and produce immunoglobulin A antibodies specific to antigens in the mother–infant dyad's immediate surroundings, providing specific protection against local pathogens. Oligosaccharides, glycoproteins and human milk lipids directly interfere with the activity of common pathogens, including *Haemophilus influenzae*, *Streptococcus pneumoniae*, *Vibrio cholerae*, *Escherichia coli*, *Giardia lamblia*, group B streptococci, *Staphylococcus epidermidis*, rotavirus, respiratory syncytial virus and herpes simplex virus-1.

Gastrointestinal infections. Multiple studies suggest that formula-fed infants face an increased risk of gastroenteritis and diarrhea. In a meta-analysis of cohort studies, Chien *et al.*³² found that infants who were formula-fed or fed a mixture of formula and human milk were 2.8 times as likely to develop gastrointestinal infection than those who were exclusively breast-fed. Data from the Promotion of Breastfeeding Intervention Trial (PROBIT) study, a randomized and controlled trial of an intervention to increase the duration of breast-feeding, found that infants in the control group were 1.7 times more likely to develop gastrointestinal illness than those in the intervention group.³³

Of particular relevance to perinatologists, among preterm infants, not receiving breast milk is associated with a 2.4-fold risk of necrotizing enterocolitis, with an absolute risk difference of 5%.¹⁹ In other words, for every 20 preterm infants who are fed breast milk, 1 case of necrotizing enterocolitis is prevented. As the case-fatality rate for necrotizing enterocolitis is 15%,³⁴ providing preterm infants with breast milk is of great clinical significance.

Otitis media

Approximately 44% of infants will have at least one episode of otitis media in their first year of life. The risk of otitis media among formula-fed infants is twice that of infants who are exclusively breast-fed for more than 3 months.¹⁹

Lower respiratory tract infection. In a meta-analysis, Bachrach *et al.*³⁵ found that infants in developed countries who were not breast-fed faced a 3.6-fold increased risk of hospitalization for lower respiratory tract infection in the first year of life, compared with infants who were exclusively breast-fed for more than 4 months. Lipids in human milk appear to have antiviral activity against respiratory syncytial virus, which causes the majority of respiratory hospitalizations for infants. In developing countries, these beneficial effects of breast milk are of even greater importance in preventing lower respiratory tract infection and mortality.

Infant mortality

One study evaluated the association between infant feeding and mortality in the first year of life.³⁶ Adjusting for maternal age, education and smoking status, as well as infant race, gender, birth weight, congenital malformation, birth order, parity, and women, infants and children (WIC) status, formula-feeding was associated with a 1.3-fold higher risk of infant mortality compared with ever breast-feeding.

Sudden infant death syndrome. Meta-analyses of case control studies suggest that formula-feeding is associated with a 1.6–2.1-fold increased odds of sudden infant death syndrome, compared with breast-feeding.^{19,37} A recent German case-control study found that not being exclusively breast-fed at 1 month of age was associated with a twofold risk of sudden infant death syndrome,³⁸

adjusting for socioeconomic status, maternal smoking and other potential confounders.

Obesity and childhood metabolic disease

Epidemiological studies suggest that children who are breast-fed in infancy are less likely to become obese^{19,39,40} or develop type II diabetes.^{19,39,41} Some studies have also suggested a reduction in risk for cardiovascular disease, including lower blood pressure^{39,42,43} and more favorable lipid profiles,^{39,44} but this literature is mixed. Researchers have proposed several mechanisms to explain these associations, including differences in composition of human milk vs formula, feeding practices, associated lifestyle factors and self-regulation of intake by the infant.⁴⁵ Moreover, human milk contains adipokines, which may have a role in regulating energy intake and long-term obesity risk.⁴⁶ Several authors have postulated that long-chain polyunsaturated fatty acids in breast milk may affect blood pressure and insulin resistance in later life.³⁹ However, a recent randomized controlled trial found that a breast-feeding promotion intervention, which resulted in substantial increases in the duration and exclusivity of breast-feeding, did not reduce measures of adiposity at 6.5 years of age.⁴⁷

Neurodevelopment

Studies examining infant feeding and cognitive development have found mixed results.^{48–50} Several authors reported modestly lower IQ scores in formula-fed children, compared with breast-fed children, whereas others reported no association between infant feeding and intelligence. Data from two randomized, controlled trials provide evidence of developmental differences with shorter durations of breast-feeding. Dewey *et al.*²⁴ randomized mothers in Honduras to the introduction of complementary foods at 4 months vs continued exclusive breast-feeding until 6 months of age. Infants in the complementary food group crawled later, and were less likely to be walking at 12 months than infants in the exclusively breast-fed group. Kramer *et al.* similarly found differences in neurodevelopment with shorter breast-feeding in the PROBIT study. At 6.5 years of age, verbal IQ scores were 7.5 points lower among children in the usual care group than among children in the group that received hospital-based breast-feeding support. Kramer's results provide causal evidence of hospital policies that support breast-feeding having an impact on neurodevelopment. Formula supplemented with long-chain polyunsaturated fatty acids, has been promoted as improving neurocognitive outcomes. However, a recent Cochrane meta-analysis⁵¹ found no benefit of long-chain polyunsaturated fatty acids on neurodevelopment among term infants in well-conducted trials.

Exclusive breast-feeding and the immune system

Early feeding has a central role in the development and maturation of the infant immune system. Compared with human-milk fed

infants, formula-fed infants have higher pH stools and greater colonization with pathogenic bacteria, including *Escherichia coli*, *Clostridium difficile* and *Bacteroides fragilis*.⁵² The more favorable colonization in breast-fed infants appears to be facilitated by bioactive factors in human milk. These oligosaccharides, cytokines and immunoglobulins regulate gut colonization and development of gut-associated lymphoid tissue, and govern the differentiation of T-cells that have a role in host defense and tolerance.⁵³ Formula-fed infants also have a smaller thymus than breast-fed infants.⁵⁴ These differences in immune system differentiation may underlie the higher incidence of allergic disease in formula-fed children. Not breast-feeding may also increase disease risk through exposure to foreign antigens in the formula.

Childhood autoimmune disease

Asthma. Multiple studies have examined the association between infant feeding and development of asthma. In a meta-analysis, Ip *et al.*¹⁹ found a 1.7-fold risk of developing asthma among formula-fed children with a positive family history of asthma or atopy and a 1.4-fold risk among those without a family history, compared with those who were breast-fed for 3 months or more. Gdalevich *et al.*⁵⁵ compared less than 3 months of exclusive breast-feeding with ≥ 3 months of exclusive breast-feeding, and found a 1.9-fold risk among those with a family history of asthma or atopy.

Atopic dermatitis. In a meta-analysis, Gdalevich *et al.* found that infants with a family history of atopy who were formula-fed or exclusively breast-fed for <3 months have a 1.7-fold higher risk of atopic dermatitis, compared with infants who are exclusively breast-fed.⁵⁶ Similar findings were reported in the PROBIT randomized trial of breast-feeding support; infants delivered in control hospitals were 1.9 times as likely to develop atopic dermatitis as those delivered in hospitals that provided breast-feeding support.

Type I diabetes. Epidemiological studies have reported an association between exposure to cow's milk antigen and development of type I diabetes, although results have been mixed.⁵⁷ In meta-analyses, <3 months of breast-feeding has been associated with a 1.2–1.4-fold increased risk of developing type I diabetes⁵⁸ compared with ≥ 3 months of breast-feeding. There is some evidence that differential recall between cases and controls may have biased results.⁵⁹ In a pilot study,⁶⁰ exposure to cow's milk-based formula was associated with higher prevalence of islet cell auto-antibodies, providing tentative evidence for a causal association between cow's milk exposure and type I diabetes.

Childhood cancer. Several studies have examined associations between formula-feeding and childhood leukemia, based on the hypothesis that immunoactive factors in breast milk may prevent viral infections implicated in leukemia pathogenesis.⁶¹ Two

meta-analyses^{19,62} found a 1.3-fold higher risk of acute lymphoblastic leukemia among formula-fed children, compared with children who were breast-fed for greater than 6 months. Kwan *et al.* found a 1.2-fold higher risk of acute myeloid leukemia among formula-fed infants, compared with infants breast-fed ≥ 6 months.

The clinician's role in supporting breast-feeding

There is compelling evidence that formula-feeding is associated with increased health risks, both for mothers and for their children. By supporting breast-feeding as the normative way to feed an infant, clinicians can have a powerful role in improving health outcomes across two generations (Figure 2).

Counseling during antenatal care

Most mothers make decisions about infant feeding early in pregnancy. Clinicians can play a crucial role in educating mothers about the health impact of infant feeding and addressing potential obstacles to breast-feeding. However, many obstetricians underestimate the importance of their advice. In a study of obstetricians and patients at a multispecialty group practice in Massachusetts, USA,⁶³ just 8% of physicians felt their advice on whether and how long to breast-feed was important. In contrast, more than 33% of mothers reported that their provider's advice on these topics was very important. It is to be noted that in a study of breast-feeding prevalence at 6 weeks postpartum, DiGirolamo⁶⁴ found that the mother's perception of their physician's opinion directly influenced breast-feeding rates at 6 weeks postpartum. Among mothers who thought their physician favored breast-feeding, 70% were still breast-feeding, whereas among mothers who thought the physician had no preference, only 54% were still breast-feeding.

When counseling patients about breast-feeding, it is helpful to ask open-ended questions, such as 'What have you heard about breast-feeding?' followed by acknowledging the mother's concerns and targeting education to her specific needs. For the mother who is planning to bottle-feed, this discussion allows for an open discussion of risks and benefits, and ensures informed consent for the feeding decision. Such an approach is more effective than asking a close-ended question, such as 'Are you going to breast- or bottle-feed?'⁶⁵

Office practices such as distributing marketing packs provided by formula manufacturers are also a major predictor of breast-feeding outcomes. Howard *et al.*⁶⁶ conducted a randomized, controlled trial of promotional materials at the first prenatal visit. Mothers received either a formula company-sponsored information pack on infant feeding or a non-commercial pack of equal value. Among mothers who were uncertain about their plans to breast-feed, those who received the formula marketing packet were 1.7 times more likely to wean than those who received the non-commercial information. This randomized trial provides

compelling evidence that physician offices should not distribute materials provided by formula makers.

Hospital practices and breast-feeding success

Maternity-care practices have a substantial effect on breast-feeding success. As the PROBIT trial demonstrated,³³ practice patterns supportive of breast-feeding can effect duration of exclusive and total breast-feed through the first year of life, as well as influence school-age health outcomes including verbal IQ.⁶⁷ Intervention hospitals in the PROBIT study implemented the Baby Friendly Hospital Initiative, a set of evidence-based guidelines developed by the World Health Organization to ensure optimal care for breast-feeding mothers and infants.⁶⁸ Currently, more than 15 000 maternity facilities in 134 countries have implemented the Baby Friendly Guidelines,⁶⁹ but fewer than 100 United States hospitals participate. One recent study estimated that only 8% of United States mothers experience all six 'Baby-Friendly' practices.⁷⁰ A recent Centers for Disease Control and Prevention⁵ study, which measured hospital practices at United States maternity hospitals and birth centers, found limited compliance with evidence-based guidelines for breast-feeding care; the 2687 maternity centers studied received only 63 of 100 possible points for high quality care. Practices associated with poor breast-feeding outcomes were common. For example, 65% of facilities routinely advise women to limit the duration of suckling at each feeding, and 45% routinely provide pacifiers for breast-feeding infants, despite the evidence that these practices decrease duration of breast-feeding.

Clinicians can advocate for better care by supporting quality improvement efforts in hospitals to eliminate outdated birthing practices. For example, a Cochrane review of randomized trials has shown that infants placed skin-to-skin at delivery breast-feed 42 days longer than infants who are swaddled in the first hour of life.⁷¹ Despite this evidence, the Centers for Disease Control's survey found that healthy mother–infant dyads experienced skin-to-skin care and initiated early breast-feeding relatively rarely.⁵ The obstetrician can directly impact this practice by placing the healthy infant on the mother's chest at delivery and encouraging hospital staff to carry out the initial assessment while the infant is with the mother, as recommended by the American Academy of Pediatrics (Figure 1).

Maternal medications and breast-feeding

During prenatal care clinicians can support breast-feeding by reviewing the safety of continuing chronic maternal medications during lactation. Postpartum, it is important to coordinate with the infant's care provider to ensure full support of breast-feeding, and close follow-up of the infant when side effects of maternal medication use is a concern. When counseling the mother, the risks of infant medication exposure must be weighed against the risks to maternal and infant health of interrupting or discontinuing breast-feeding. Reliable information on the safety of

Figure 1 The importance of skin-to-skin contact at delivery.² Healthy infants should be placed and remain in direct skin-to-skin contact with their mothers immediately after delivery until the first feeding is accomplished.

The alert, healthy newborn infant is capable of latching on to a breast without specific assistance within the first hour after birth.

- Dry the infant, assign Apgar scores, and carry out the initial physical assessment while the infant is with the mother.
- The mother is an optimal heat source for the infant.
- Delay weighing, measuring, bathing, needle-sticks and eye prophylaxis until after the first feeding is completed.
- Infants affected by maternal medications may require assistance for an effective latch-on.
- Except under unusual circumstances, the newborn infant should remain with the mother throughout the recovery period.

medication use during lactation is available online, free, through LactMed, a National Library of Medicine database. Unfortunately, a recent study⁷² found that the quality of information in other electronic databases is highly variable. LactMed includes a monograph on each medication that summarizes data on lactation safety and lists alternative medications from the same class that may be preferred during lactation.

Facilitating lactation for mothers of preterm infants

Qualitative studies suggest that mothers of preterm infants respond well to counseling about the effect of breast milk on preterm infant health;⁷³ even those who initially planned to formula-feed do not report feeling pressured or coerced to breast-feed. Rather, mothers of preterm infants felt their milk ‘made the difference’ for their baby, and they were empowered by the chance to contribute to their infants’ care.⁷⁴ This work contradicts commonly-held beliefs that mothers of preterm infants are too stressed or overwhelmed to breast-feed.⁷⁵

Rather than asking, ‘Are you going to breast-feed?’ clinicians can ask, ‘Would you be willing to provide milk while your baby is in the neonatal intensive-care unit?’ To establish a sufficient milk supply, mothers of preterm infants should initiate expression of milk within 6 h of delivery, using a double-sided, hospital grade electric pump 8–12 times a day.^{76,77} Counsel the mother that she may produce only a few drops of colostrum in the first 2–3 days; however, trophic feeding with this immunoglobulin-rich material may improve gut function in the preterm neonate, and early use of expressed colostrum appears to increase maternal milk production.⁷⁸ It is important to advise mothers that pain, stress and anxiety interfere with release of oxytocin and reduce milk let down.⁷⁹ If mothers experience nipple pain while pumping, they should reduce the suction on the pump, and a trained nurse or lactation consultant should ensure that the pump flange fits properly. Continued pumping despite pain can lead to nipple trauma and infection. Expressing milk at the infant’s bedside, or while looking at pictures of the infant, improves let down and

Figure 2 Supporting initiation and continuation of breast-feeding.

During antenatal care

- Ask women, ‘What have you heard about breast-feeding?’ Tailor counseling to specific concerns or questions.
- Communicate and endorse consensus guidelines for breast-feeding: recommend 6 months of exclusive breast-feeding, with continuation through 1 year and beyond, as long as is mutually desired.
- Refer women to antenatal breast-feeding education classes.
- Review the safety of chronic maternal medications during lactation, in conjunction with the pediatric care provider.
- Do not distribute brochures or gifts provided by makers of infant formula.

Among women experiencing preterm birth

- Counsel mothers that, for preterm infants, ‘Mother’s milk is medicine’.
- When preterm delivery is anticipated, ask, ‘Would you be willing to express milk for your baby while he or she is in the neonatal intensive-care unit?’
- Advise mothers to initiate milk expression as soon as possible after birth, ideally within 6 h.
- Include a physician’s order to initiate milk expression in the postpartum order set.
- Request a consultation from a lactation consultant within 24 h of birth.

At delivery at term

- Include breast-feeding counseling as part of anticipatory guidance during labor. Ask, ‘What have you heard about breast-feeding?’ and target education to the mother’s questions and concerns.
- Review recommendations for early breast-feeding, including skin-to-skin care at birth, rooming in and feeding on demand.
- Place infants skin-to-skin after birth and reinforce this practice.
- Do not distribute brochures or gifts provided by makers of infant formula.

Everyday

- Advocate to eliminate distribution of gift packs from formula manufacturers by hospitals in your community.
- Support implementation of the Baby Friendly Hospital Initiative.

milk production. Mothers should express milk for 10–15 min per pumping session. Once milk supply is established, they should continue until 1–2 min after flow stops, but for no longer than 30 min. A recent study suggests that betamethasone may reduce milk production between 3 and 9 days after administration.⁸⁰ Mothers who received antenatal corticosteroids shortly before delivery should be encouraged to continue to express milk regularly to establish a supply.

Conclusions

Formula-feeding places mothers and infants at increased risk of a broad spectrum of adverse health outcomes, ranging from infectious morbidity to chronic disease. Given compelling evidence for differences in health outcomes, breast-feeding should be acknowledged as the biological norm for infant feeding. Physician counseling, office and hospital practices should be aligned to ensure that the breast-feeding mother–infant dyad has the best chance for a successful breast-feeding experience throughout the infant’s first year of life, and as long thereafter as is mutually desired by mother and child.²

For further information

Academy of breastfeeding medicine protocols.

<http://www.bfmed.org/Resources/Protocols.aspx>

The Academy of breastfeeding medicine (ABM) is an international organization of physicians interested in the promotion and management of breast-feeding. The web site includes Department of Health and Human Services (DHHS)-funded evidence-based clinical guidelines for management of lactation issues.

LactMed. <http://lactmed.nlm.nih.gov/>

A service of the National Library of Medicine's ToxNet, LactMed is a free online database of monographs on medication safety in lactation.

Nutritional support of the very low birth weight (VLBW) infant toolkit. http://www.cpqcc.org/quality_improvement/qi_toolkits/nutritional_support_of_the_vlbw_infant_rev_december_2008

This is a comprehensive guide to supporting breast-feeding for the preterm infant, which includes quality improvement steps, handouts for patients and staff, and references.

Baby friendly USA. <http://www.babyfriendlyusa.org/>

Baby friendly USA is a non-profit organization that implements the Baby Friendly Hospital Initiative in the United States. The web site includes information on how the United States maternity centers can apply for Baby Friendly certification.

Conflict of interest

The authors declare no conflict of interest.

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